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EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It contains selected reading pages from the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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For a number of years, good progress has been made in this country in providing relief departments for railroad employees; reading rooms, lodging houses, technical instruction for shop apprentices, etc. However, in a letter recently received, a well-known chief engineer of a large western system expresses the opinion that one group of railroad employees do not receive the recognition and attention that they deserve. These are the men who live in the thinly settled, and the so-called desert regions, of the western country—chiefly section and bridge men and station agents—who perforce have pretty lonesome, monotonous existences. This officer had long desired to ameliorate, so far as possible, the living and surroundings of this class of employees on his own road, and his first efforts were directed to providing the most comfortable possible places for them to live in. The good results of this made themselves apparent, and the next idea was to provide a means of entertainment as well as of personal improvement by giving them suitable books and papers to read. This involved the formulation of a circulating library scheme and he personally worked out the details of a plan; but before it could be put into effect he went to another road and the plan was not carried out. His interest in the matter has not lessened, however, his letter evincing his desire still to see the condition of this class of labor in the localities described made as pleasant as possible under the circumstances. Ideas and efforts of this sort deserve every encouragement, for aside from the humane phase of the matter, which is the primary one, the results confer material benefit to employer and employee alike; for the appreciation of the latter manifests itself in greater loyalty to the road and increased interest in his work, with consequent improvement in quantity as well as quality of service performed.

The number of freight cars owned and controlled by the companies in the American Railway Association has now passed the two-million mark, and from the first day of next July the handling of these cars in interchange traffic is to be improved and simplified by the adoption of a rate of 50 cents a day for the use of each car when off from its own road, and by the abolition of the rule providing for an increased rate after a car has been away from home 30 days. Fifty cents is to be the uniform rate without regard to dates. As the reader will remember, this rate has already been put in force by a number of important roads, but now, by formal letter ballot, the other roads in the Per Diem agreement have agreed to adopt it. The exact number of cars reported is 2,003,235 (United States, Canada and Mexico), and the number of members in the association is 319. All of these voted except 21 companies, representing 35,131 cars. In accordance with a resolution passed at the October meeting each member, in voting, expressed a first and a second choice, and in counting the first choices it was found that 95 members, controlling 910,978 cars, were in favor of a rate of 75 cents, but no proposition was to be carried, except by a majority vote of members and a two-thirds vote of cars, and under this rule none of the propositions was adopted; but under the provision for first and second choices the secretary had the power to recount in such a way as virtually to take a second vote; and, pursuing this course, and counting both first and second choices, he was able to show for the 50-cent rate 231 roads, controlling 1,625,041 cars, and so this rate will prevail. This matter being settled, the principal business to be attended to at the spring meeting of the Association at Chicago next week will be the report of the Committee on Car Efficiency, which, we understand, will show that considerable progress has been made in clearing the way toward agreement on some action looking to the cure of the more flagrant freight car abuses. With a view to clearing the air before the association gathers in formal meeting on Wednesday all roads have been invited by the committee to attend an informal meeting at the Auditorium Hotel on Monday for the purpose of discussing the problems which are before the committee.

In the "free silver" presidential campaign of 1896, of McKinley against Bryan, when the leading issue was the fiscal one of the capitalist against the debtor, probably no argument was more effective in the result than the appeal to the great class of voters having deposits in savings banks. It was urged with forcefulness on the stump and in print that the savings bank depositor was himself a capitalist, a member of the creditor group, and that impairment of the purchasing power of his principal and dividends by depreciation of the currency directly smote his interests. In the look ahead, in the present exigency, at the forces to be aroused that must safeguard honestly vested capital against radical attack, has this savings bank element in the body politic been considered or, indeed more than dimly hinted at. Stated in rough figures, with returns somewhat incomplete, the savings banks of the United States now contain $3,300,000,000 of deposits, or almost three per cent. of the

estimated total wealth of the country. Of their deposits about $350,000,000, or more than 10 per cent., are invested in railroad stocks and bonds and, particularly in the Eastern states, that branch of savings bank investment has, of late years, increased rapidly as compared with other branches. The number of savings banks depositors in the country number somewhat more than 8,000,000 with an average of about $425 to each depositor. It is true that each deposit is returned as a depositor, and that some depositors have several deposits; but allowance for the fact would still leave the number of depositors at stalwart figures and well up in the millions. It is also true that many of the depositors are women; but the women have husbands, fathers, brothers and sons, most of whom have votes. In this vast group, for all practical purposes representing railroad investment however indirect—a group powerful, responsive and with a pocket nerve—investors, chilled by attacks on railroad corporations, may find comforting assurance that railroad baiting has its limits.

ECONOMICS OF RAILWAY LOCATION

The committee of the American Railway Engineering and Maintenance of Way Association on "Economics of Railway Location" has without doubt the most important work to perform of any committee in the history of the association. It was formed "for the consideration of all questions connected with railroad location, grades, lines and improvements of grades and lines affecting the economic operation with relation to traffic, tonnage ratings, speed, density of traffic and financial considerations, with the special aim in view of establishing uniform methods and unit values for investigating and analyzing the relative changes and costs of comparative routes or proposed grade reductions and line corrections."

Wellington's classic of similar title is now more than 20 years old, and although it is still a standard reference for railroad engineers on certain broad fundamentals, conditions and practice have so changed, the art of railroading has grown and advanced so tremendously, since its production, that this splendid work is in most respects far out of date. And although there have been later attempts to cover this same field, it may safely be asserted that the great work on railroad economics is still to come. It would seem that no better way could possibly be found for the production of such a work than that which has been adopted by the American Railway Engineering and Maintenance of Way Association; for in the first place it will be evolved step by step with the intelligent and painstaking care which characterizes the proceedings of this association; and it will be the composite work, primarily of a corps of the country's most capable engineers, who have had wide and valuable practical experience in the questions to be considered, and secondarily, of a body made up of practically the entire railroad engineering talent of the North American continent. Such conditions can hardly fail to produce a work which will meet present needs as nearly as it is practicable to do so.

The field embraced by the scope of the work is so vast that it will probably require several years for the committee to complete its labors. The report submitted at the recent convention, as stated therein, was preliminary in character, and indicated the first steps in the study of the broad problem embodied in the subject. It is understood that the work which the committee has laid out for itself at present embraces the subjects of train resistance—which was considered in the first report—the maximum capacity locomotive to be adopted under given conditions, and the economical limit of grade reduction. The last-named of these is among the most difficult and important of the problems confronting American railroad engineers at the present time and therefore one on which light is most earnestly desired. It will be remembered that the paper of Mr. J. B. Berry, then Chief Engineer of the Union Pacific, presented to this Association in 1904, placed this economical limit at 0.4 per cent. Many roads have adopted a 0.3 per cent. minimum. Of course, these extreme reductions involve in practically all cases a large increment in additional cost for each additional 0.1 per cent. reduction. Whether or not the operating results have in any instance justified the added outlay beyond a certain limit will be a part of the committee's work to determine, assuming that the proper co-operation will be accorded by the roads in all instances.

A further troublesome feature of the grade reduction problem is the failure in many instances to realize the expected results in the matter of maximum train load which the preliminary theoretical estimates, or the dynamometer car experiments, promised. Numerous instances of this sort can be cited. One which we have in mind at the moment is that of a line projected through a rugged country requiring the exercise of the greatest care in location. As a result of the most careful study by skilled engineers, based on dynamometer car experiments and other essential factors, a certain ruling gradient was determined, to permit trains of a given maximum tonnage to be hauled in the direction of greatest traffic movement. When the line came to be operated, it was found necessary to reduce the maximum loading appreciably in order to get the trains over the road satisfactorily. As the project was comparatively a recent one we have not learned whether the causes for this failure to realize expected results have been ascertained. Another instance of similar character was cited by Mr. Byers, of the Missouri Pacific, in the discussion of the committee report, the reduction in this instance being necessary to avoid excessive overtime. The Missouri Pacific engineers' study of the situation impressed them with the fact that distances between side tracks are an important consideration on single-track lines in the matter of getting the best results from grade reduction.

The complete success of the undertaking will depend in large measure on the co-operation of the different roads, both in the matter or furnishing the experimental data desired by the committee, and in giving freely and as fully and accurately as practicable the results yielded by any work which has been done along the line covered by the committee's researches. In this latter case, where an expected condition has not been realized, where the results have not justified the expenditure, a railroad company may prefer not to make known its figures for reasons of financial policy. It must be borne in mind, however, that only in this way can the association fully accomplish its valuable purpose, the successful attainment of which is of vital importance to all existing roads, as well as those of the future. Furthermore, supplying such information to the committee does not mean that the name of the road need be made generally known; for where this would be objectionable the essential data can be presented in the report and the name of the line withheld without detracting materially from the value of the figures. But even though it should mean the risk of some present criticism and possible temporary unfavorable financial effect, any data which will contribute to the advancement of this great common cause should be given without hesitation.

BRITISH PRACTICE IN ACCIDENT INVESTIGATION.

We print in another column a clear and comprehensive statement of British practice in railroad accident inquiries, by Lieut.-Col. Yorke, Chief Inspecting Officer of the Board of Trade, Railway Department. This memorandum shows that the Regulation of Railways Act, passed in 1842, obliges every British company to give notice to the Board of Trade of its intention to open for passenger traffic any railroad or section of railroad, whereupon the Board of Trade is required to inspect the line, and if the officer performing the inspection is of the opinion that the opening of the road would be attended with danger to the public using it, the opening can be postponed a month at a time until the requirements of the inspector are satisfied. After a railroad has been opened the department has no further power to inspect, except in the case of some alteration or addition being made. Moreover, after the original inspection has been made, although it is the duty of the company to maintain the line in accordance with the original standard of efficiency, the Board of Trade has no power to enforce this, but the Act of 1871 requires railroad companies to report with great fulness any accident which may occur on or about the railroad or its works, provided that this accident is attended with loss of life or personal injury; that it was a collision in which one of the trains was a passenger train; that any passenger train or part of it left the rails, or that the accident was likely to have caused loss of life or personal injury and was of a type specified on that behalf by any order made by the Board of Trade. The Board of Trade, upon receiving such notice, proceeds to investigate the accident in the fullest manner, the details of which are shown in Colonel Yorke's memorandum.

Attention has been called to the Board of Trade method of inspection and inquiry, because the task is not undertaken by the Railway and Canal Commission (corresponding in a broad sort of way to our Interstate Commerce Commission), but is performed by a branch of the Board of Trade, an entirely distinct organization which is itself a branch of the government. Moreover, the inspectors are chiefly derived from the engineering department of the army. Colonel Yorke is of the opinion that this was originally

accidental but that, as it seems to have worked well, it has been continued. The earliest inspections of railroads and investigations of accidents in Great Britain were held in the year 1840, at which time there was no body of railroad men available from which the advisors of the government could be drawn, while the organization of the civil engineering profession was also at that period deficient. At that time, the military engineers were the only engineers who had to pass any examination to prove their aptitude for their profession.

In the light of the experience of the past two generations, it seems clear that this original accident of circumstance, which caused the inspection body to be drawn from the army, was a fortunate one. The British press, always keen and observant in its criticism of public matters, finds no cause for complaint in the judgments given by this inspecting board. The explanation of an accident, as derived from the hearings of the inspectors, may very likely fail to convince the trained railroad man, but the main thing is that the inspection is made surely, quietly and intelligently by a fixed body of men detailed for that purpose, who have behind them so great a force of public opinion that their recommendation carries almost the force of statute. A Board of Trade inquiry into an accident is, theoretically, supplementary to and independent of any proceeding by the coroner or magistrate. The Act of 1871 confers upon the coroner—when holding an inquest on the death of a person occasioned by a railroad accident—the right to request the Board of Trade to appoint an inspector or some person possessing special knowledge to assist, and this is sometimes done. On the other hand, the Board of Trade is empowered to hold what is called a formal investigation, if it so desires, in addition to the less formal inquiry which we have mentioned. This formal investigation adds to the Board of Trade inspecting body a trained lawyer, or the co-operation of a judge, and combines the ordinary court powers with the special inspecting powers of the Board of Trade, but these formal inquiries are seldom made. The informal inquiry is generally quite sufficient, and although it does not carry the force of law, it carries a prestige which serves all useful purposes.

An important point to be observed is the distinction that the inquiry by the Board of Trade is made for the purpose of ascertaining the cause of the accident with the view of preventing a recurrence of it, and not for the purpose of penalizing anybody. "Vengeance is mine, saith the Lord." The importance of this distinction is considerable, for it enables the inspector and the railroad officer to work together in entire sympathy and co-operation, instead of pitting one against the other in a contest of wits; one seeking to find evidence, the other to hide it.

We have taken occasion to point out more than once in these columns the extremely loose and unsatisfactory mode of procedure following an accident in this country. The coroner, the state railroad commission, the district attorney, the newspapers and the officers of the road all conduct their examinations at the same time. Each investigator views the others with suspicion, and the chances are that only one of the five parties at interest, that is to say the railroad party, is concerned more in an intelligent effort to understand and to prevent repetition than in an effort to lay hands on the particular person at fault and make an example of him. In other words, while British examinations of the causes of an accident are preventive, American examinations are almost entirely punitive. It follows as a matter of course that the true cause of the American accident is often never known by a responsible inspecting body; a state of affairs which is genuinely unfortunate for all concerned. The superintendent or general manager is probably anxious to make his operating practice better, but an improvement immediately following upon an accident only gives the press, eager for scandal, the opportunity to say that the improvement should have been made long ago; moreover, it may well be that the superintendent or the general manager is blocked in his efforts at reform by the fact that the powers above him do not see the matter as clearly as he does, and are unwilling to make the necessary appropriation. Both of these difficulties are obviated in Great Britain by the straightforward report of the Board of Trade inspectors, who avoid all sensationalism in their efforts to get at the real cause of the trouble, and then place that cause before the governing body of the railroad, where, as we have said, the report carries almost the force of statute.

The highly discreditable conflict between authorities that attends the investigation of American accidents, the diverse reports made by the different parties at interest, likely to be strongly marked with sensationalism and given broadcast to the newspapers, half studied and half understood, with the underlying idea that of revenge instead of reform, stand in sharp contrast to the methods in use for the last 36 years in Great Britain. The need for some such inspecting body in this country is surely a great one, and we think the desirability of having that body entirely independent from the Interstate Commerce Commission, non-political, and above suspicion as to its disinterestedness, will appear plain to all.

Train Accidents in March.[1]

Our record of train accidents occurring on the railroads of the United States in March includes 19 collisions, 25 derailments and three other accidents, 47 accidents in all. This record is not published in full, as was formerly done, except in the cases of the few accidents which are especially prominent—in the present instance five collisions, four derailments and one explosion. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—will henceforth be given as below, in the shape of one-line items, for each accident, showing date, location, class and number of deaths and injuries.

This record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager. The official accident record published quarterly by the Interstate Commerce Commission is regularly reprinted in the *Railroad Gazette*.

The 10 prominent accidents in March are distinguished in the list by printing the name of the road in italics. Following are condensed accounts of the circumstances of these 10 accidents.

The collision near Powder Springs, Ala., on the 1st was due to a runaway. Passenger train No. 38 collided with a string of freight cars and the whole passenger train and five freight cars took fire and were burnt up. The freight cars, 22 of them, all loaded, were being backed in on a siding to clear a passenger train. A cut-off cock blowing off from the air pipe, it was necessary to use hand brakes. While backing in the train broke in two and the second car derailed the engine, a drawhead having been pulled out. This left the caboose and 20 cars in the hands of conductor alone on a 1 per cent. descending grade. He started from the rear to set up the brakes, and succeeded in setting 16, but was unable to control the cars until they had run some distance on the main line. When the cars stopped they had got beyond the flagman and the conductor was only able to get back six car lengths from the rear before No. 38 came in sight around a 3 deg. curve obstructed by a cut. The engineman was killed.

The collision at Colton, Cal., on the 1st, was due to a combination of a misplaced switch, an uncolored switch target and, apparently, a heedless engineman. Passenger train No. 55 of the Atchison, Topeka & Santa Fe collided with a freight train of the San Pedro, Los Angeles & Salt Lake, both trains being on the same railroad. It appears that the freight had entered the side track and that the man or men in charge had neglected to straighten the switch. When the passenger train approached hand motions were made to stop it, the error having been discovered, but the engineman says that although he saw the motions, he thought they were made in connection with switching movements, and were intended for the engineman of the freight. He says that he did not see the switch target in season, because it had no distinctive color, having been long exposed to the weather. A coroner's jury held that he was running at excessive speed. The fireman of the passenger train was not keeping a lookout, but as soon as he heard a shout of alarm he stopped the flow of oil from the tender to the firebox, and, thus, probably prevented the burning of the cars. Both of the engines were wrecked as were the first two cars of the passenger train. One passenger was killed, the

[1]Abbreviations used in Accident List:

rc.....Real collision.
bc.....Butting collision.
xc.....Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars, or a collision due to a train breaking in two on a descending grade.
b.....Broken.
d.....Defective.
dr.....Defect of roadway.
eq.....Defect in car or engine.
n.....Negligence.
unf.....Unforeseen obstruction.
unx.....Unexplained.
derail....Open derailing switch (negligence of engineman or signalman).
ms.....Misplaced switch.
acc. obst..Accidental obstruction.
malice....Malicious obstruction of track or misplacement of switch.
boiler.....Explosion of boiler of locomotive on road.
fire.....Cars burned while running.
Pass.....Passenger train.
Ft.....Freight train (includes empty, engines, work trains, etc.).
*Wreck wholly or partly destroyed by fire.
†One or more passengers killed.

fireman was fatally injured, and 30 passengers and trainmen were less severely hurt.

The butting collision near Naugatuck, Conn., on the 1st, was between a northbound regular passenger train and a southbound special train carrying a military company accompanied by the Governor of the state. It occurred about 1 a.m. One engineman and both firemen were killed and two passengers and two employees were injured. The special train had run about 40 rods beyond the point at which it should have taken the siding for the regular train.

The butting collision of freight trains on the 3d at Maugansville, Md., wrecking both engines and several cars, was due to the failure of the operator at Mason and Dixon to deliver an order to one of the trains. This operator, 18 years old, was held under $500 bail on a charge of manslaughter.

In the butting collision at Los Angeles, on the 23d, four passengers were killed and 20 or more injured. Both trains were running at good speed and both of the engines were wrecked. The reports say that the collision was due to disregard of a train order by the engineman of the overland express, who ran 600 ft. past a station where he should have stopped. It appears that this engineman had taken someone's word as to what was required by his order and had not carefully read it himself. Both the conductor and the engineman of this train were arrested and held in $5,000 bail each.

The derailment at Warsaw, Ohio, on the 2d, was due to the engineman being asleep while standing in his place in the cab. The train consisted only of the engine and a caboose. It ran off a derailing switch and both the engine and the caboose were overturned. The fireman, who was also asleep, was instantly killed. It is said that these men had been on duty only 7½ hours, and the entire crew had been off duty 14 hours before starting on this trip. The men in the caboose were only slightly injured.

The malicious derailments of the 22d and 27th are notable as having occurred within a few miles of each other and apparently at the hands of the same persons. The cases were reported in the *Railroad Gazette* of April 5 and April 12. In both cases rails were loosened, but care was taken to leave the bond wires at the joints unbroken so that the automatic block signals should continue to indicate a clear track.

The derailment at Colton, Cal., on the 28th, about 4 p.m., the second disaster in this town in the month of March, the third in southern California, and by far the worst in this record, was due to a misplaced switch. The westbound Sunset Limited, running about 11 hours behind time, approached the station at very high speed, and the engine was overturned and the first three cars badly wrecked. Of the killed 18 were Italian laborers. The switch had been left open by the men operating a switching train. Evidently there was flagrant disregard of rules by a number of different men. The men in charge of the switching train went on duty at 5 a.m., and at that time saw a despatcher's order saying that passenger train No. 9 would run eight hours late, making it due at 1:45 p.m. Receiving no further information about the train they assumed, about 3 p.m. (having been off for luncheon between 11 and 12) that train No. 9 had passed. At 3 o'clock the blackboard at the yard office had notes concerning other trains behind time, but nothing relative to No. 9. From this it would appear that the yard conductor or foreman had no regular hours for calling at the yard office or elsewhere for orders and that the despatcher, or the operator, or both, had failed to notify him that the train was later than had been specified in the first order. Whatever the cause, these men about 3:45 went in on a private track some distance from the main line, leaving the switch open and unguarded. The passenger train, consisting of a large engine and 14 cars, approached on a descending grade at a high rate of speed, said to be about 60 miles an hour, though the rule appears to be that passenger trains behind time must run under control within yard limits. This train had been within the yard limits for nearly a mile before reaching the point of collision. The target of the misplaced switch was in plain view and could have been seen by the engineman. Some one on the switching engine in the siding saw or heard the express some seconds before it reached the spot and sounded the whistle of the switching engine as an alarm, but no one succeeded in reaching the switch in season to set it straight. Both the engineman and the fireman of the passenger train were severely injured. The fireman had succeeded in shutting off the flow of fuel oil before reaching the switch, thus, no doubt, preventing the burning of the wreck. One of the brakemen of the switching crew had worked in this yard only three weeks; the engineman of the switching engine only three days, and the fireman only one day; and he had had only two weeks' experience as a fireman. The yardmaster testified before the coroner that it was not his duty to see that the foreman of switching had information about delayed trains, though if he happened to see the foreman he usually told him about such trains.

The accident at Cumberland, Md., on the 31st, in a car of an eastbound freight train, wrecking several cars, was an explosion of railroad torpedoes. In the same car were tanks of carbonic acid, and it is said that the cylindrical tanks rolled against a case of torpedoes while the train was in motion and thereby caused the explosion.

TRAIN ACCIDENTS IN THE UNITED STATES—MARCH, 1907.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Killd.	Inj'd.
*1.	*Seaboard Air Line*....	Pwdr Spgs.,Ga.	xc.	P. & Ft.	1	2
†1.	*Atch., Top. & S. Fe*...	Colton, Cal.	bc.	P. & Ft.	2	30
2.	*N. Y., N. H. & Hart*...	Naugatuck.	bc.	P. & P.	3	4
3.	*Cumberland Valley*....	Maugansville.	bc.	Ft. & Ft.	1	0
6.	Tol., St. L. & Westn..	Neoga, Ill.	bc.	P. & Ft.	0	14
7.	Chi., M. & St. P. and Chic., Burl. & Q....	Bettendorf, Ia.	bc.	P. & P.	1	4
7.	.....	Geneva, Ill.	bc.	Ft. & Ft.	2	3
9.	Mo., Kan. & Texas....	Lorena, Tex.	xc.	P. & Ft.	3	0
12.	Boston & Maine	Williamstown.	bc.	Ft. & Ft.	1	3
12.	Chesapeake & Ohio....	Sewell, Va.	rc.	Ft. & Ft.	1	1
12.	New York Central.....	Hyde Park.	xc.	Ft. & Ft.	2	0
12.	Gulf, Sab. & R. R.....	Fields, La.	xc.	Ft. & Ft.	2	0
†12.	Chicago, Burl. & Q....	Merino.	rc.	Ft. & Ft.	1	0
13.	Louisville & Nashville.	Rockland.	bc.	Ft. & Ft.	1	2
16.	Grand Trunk.	Bancroft, Me.	xc.	P. & Ft.	0	10
21.	Norfolk & Western...	Crewe, Va.	xc.	P. & Ft.	1	3
†23.	*Atch., Top. & S. Fe*...	Los Angeles.	bc.	P. & P.	4	20
25.	St. Louis, I. Mt. & S. and St. L. & S. F...	Jonesboro.	xc.	Ft. & Ft.	1	3
31.	Baltimore & Ohio	Fairmount	bc.	P. & Ft.	0	1

Derailments.

Date.	Road.	Place.	Kind of train.	Cause of derail't.	No. persons reported Killd.	Inj'd.
1.	Chic., Rk Isld & Pac..	Enid, Okla.	Pass.	ms.	1	3
2.	*Cleve., Akron & Col*....	Warsaw.	Ft.	derail.	1	0
2.	Alabama Gt. Southn..	Powers.	Ft.	ms.	1	2
3.	San Pedro, L.A. & S.L.	Los Angeles.	Pass.	ms.	2	5
5.	New York Central....	Barrytown.	Pass.	b. rail.	0	9
6.	Pennsylvania	Warren, Pa.	Pass.	derail.	0	9
†8.	Great Northern	Ojata, Minn.	Pass.	unx.	3	4
11.	Pennsylvania	Metuchen, N. J.	Ft.	boiler.	3	1
12.	Chesapeake & Ohio ...	Hinton, W.Va.	Pass.	landslide.	2	0
13.	Pennsylvania	Harmansville.	Ft.	flood.	3	0
14.	Cin., Ham. & Dayton..	Jamestown.	Pass.	d. track	2	0
15.	Erie	Meadville.	Ft.	unx.	2	3
15.	Chic., Rk. Isld. & Pac.	Cuneo.	Pass.	ms.	2	7
18.	Pitts. & Lake Erie....	Fallston.	Ft.	landslide.	0	4
20.	Denver & Rio Grande..	Osier.	Pass.	unx.	0	7
22.	*Pennsylvania*	Stewart.	Pass.	malice.	0	14
22.	C., C., C. & St. Louis.	Avon.	Pass.	acc. obst.	1	11
26.	Wabash.	Pendleton.	Pass.	d. track.	0	16
27.	*Pennsylvania*	Wilmerding.	Pass.	malice.	0	0
27.	Northern Pacific	Carlton.	Pass.	unx.	2	2
27.	Louisville & Nashville.	Thomaston.	Pass.	unf.	3	0
27.	Pitts. & Lake Erie....	W. Middlesex.	Ft.	washout.	0	1
28.	Lake Shore & M. S....	Lockwood.	Ft.	boiler.	1	2
28.	*Southern Pacific*	Colton.	Pass.	ms.	22	58
29.	Chic., Rk. Isld. & Pac.	Oklahoma C.	Pass.	unf.	3	8

Other Accidents.

1.	Chic., Rk. Isld. & Pac..	Shawnee,Okla.	Ft.	boiler.	2	2
25.	Atch., Top. & S. Fe...	Onava. N. Mex.	Ft.	boiler.	3	0
31.	*Baltimore & Ohio*.....	Cumberland.	Ft.	explosion.	0	0

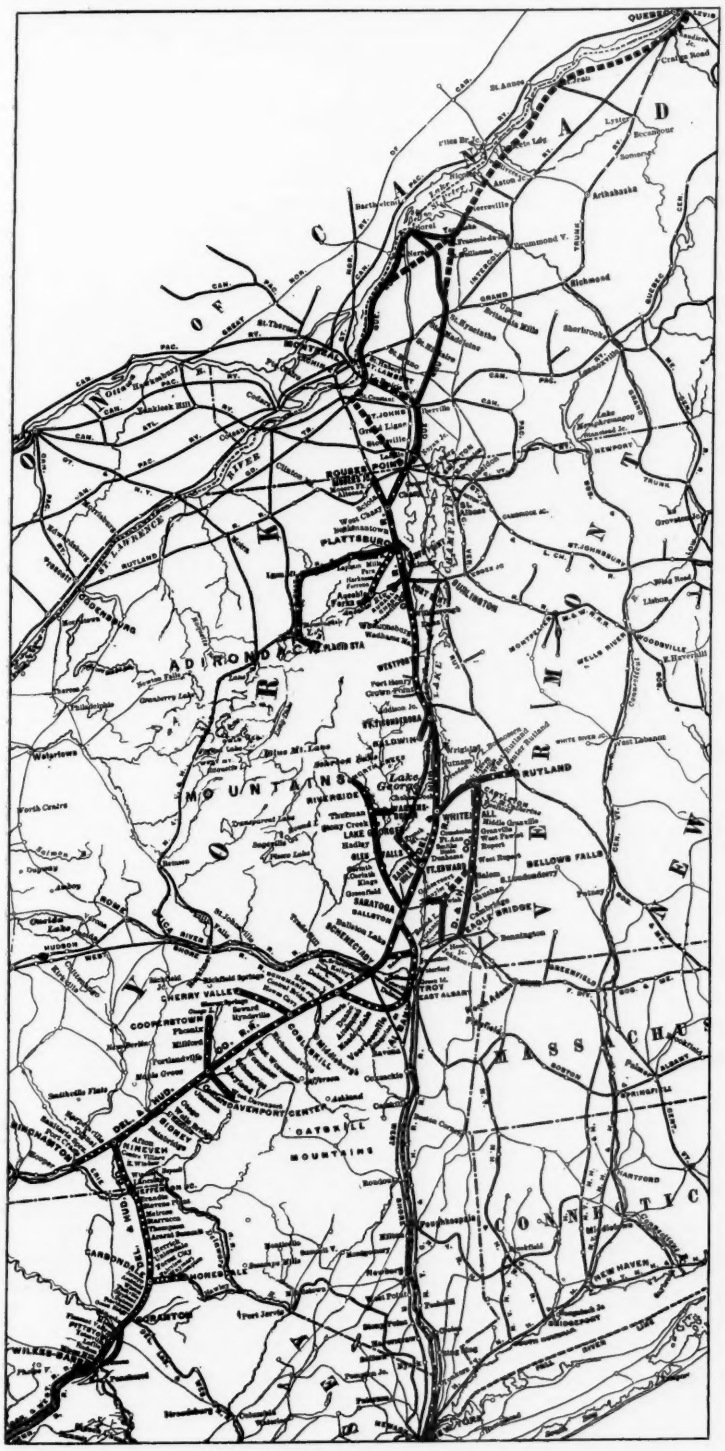
A press despatch from Galveston says that the railroads of Texas have made an offer that, if the passenger fare is not reduced to 2 cents, they will expend $15,000,000 in extensions and improvements in Texas within the next fourteen months. This is important if true. A Texas railroad officer tells us however that it is not true. We regret to find it false. Nothing could be more rational than to thus put in concrete form an argument which railroads are all the time using in the abstract, that is to say, in a form so very abstract and shadowy that nobody cares anything about it. The difficulties are great, however, and our Texas friends have, no doubt, found them insurmountable. Who shall make such an offer? Only in a very limited way can a half dozen railroads adopt a uniform policy as regards improvements. To whom shall the offer be made? No legislature is likely to bind its successors. Who could make the details of such an arrangement clear, so that the public could form an opinion of it intelligently? Without an intelligent public opinion anything like a bargain between the railroads and the state would be mischievous. The Galveston news mill is to be congratulated on its ability in the department of fiction, but the realization of this attractive scheme will probably come with the Channel tunnel and the Chicago & Englewood six-track passenger subway.

Delaware & Hudson.

A number of happenings have marked the past year as important in the history of the Delaware & Hudson. Most noteworthy probably is the election of Mr. Loree as President. This brings to the road as executive head a highly trained and successful operating railroad man. His influence, which in his short tenure of office thus far on the Kansas City Southern has been so strikingly shown in actual results is likely to be strongly felt.

Next in importance, particularly because it is a new policy, is the expansion of the road in Canada. In the past the Delaware & Hudson has owned no road north of the international boundary, entrance to Montreal being gained by 50 miles of trackage rights over the Grand Trunk from Rouses Point. In future the Delaware & Hudson is to have, with only 16 miles of leased trackage, not only its own entrance into Montreal, which will give it the shortest line between Albany and Montreal, but a line to Quebec, which will give it the shortest line between Montreal and Quebec and, with the

New York Central between New York and Albany, the shortest line between New York and Quebec. This is throwing down the gage in the Quebec-Montreal territory to the three dominating Canadian systems and the Canadian government's own road, the Intercolonial, all of which have lines between the two cities. The beginning of this development was the purchase late in 1905 of the Quebec Southern, a bankrupt road in the province of Quebec with 145 miles of line, part of it along the south shore of the St. Lawrence river below Montreal. This has been taken over by a new company, the Quebec, Montreal & Southern, of which the Delaware & Hudson owns all the capital stock. To connect with the new property, arrangements are to be made for running rights over five miles of track from Rouses Point to Noyan Junction, where the Quebec, Montreal &



Delaware & Hudson.

Showing new lines owned, building and projected in Canada.

Southern's line begins. From its present northeastern terminus at Pierreville the local road is to be extended northeast along the south bank of the St. Lawrence toward the city of Quebec. During the present year it is to be carried 48½ miles and as soon as the Quebec bridge is finished, 43½ miles further to the southern end of this bridge, over which arrangements will no doubt be made for direct entrance to Quebec. For the Montreal entrance, the Napierville Junction Railway has nearly finished a line from Rouses Point to St. Constant, 27 miles, and arrangements have been made for running rights over the Grand Trunk from St. Constant to St. Lambert, opposite Montreal, and across the river into Montreal with the use of Grand Trunk terminal facilities in that city. With these two additions the Delaware & Hudson will have a mileage of 263½ miles of lines owned and 16 miles of trackage rights, making 279½ miles in all, as against nine in Canada previously. The new Canadian lines as already built or projected are shown for the first time on the accompanying official map.

Particular reasons for these Canadian extensions are not far to seek. On the northern divisions of the D. & H.—the Saratoga and Champlain—passenger traffic is more important than its usual proportion on most railroads. In particular the through travel to the Adirondack mountains and Montreal, much of which comes north from New York over the New York Central to Troy, has been profitable. With its own lines, and the short lines from New York to Montreal and Quebec, the Delaware & Hudson will have great advantages over other routes on through passenger business. Another reason is that there are many paper mills on the present lines of the road, whose pulp wood supplies, south of the border, are beginning to fall short. These extensions into Canada will make it possible for the company to transport over its own rails the supplies of pulp wood necessary for operation of these mills.

Other important events of the year were the increase in the annual dividend rate from 7 per cent., which it has been since 1900, to 9 per cent. in 1907, and purchase of the Hudson Valley Railway, the road's most important long-distance electric competitor. From a physical and operating standpoint, probably the most important work was the beginning of construction on a new, larger and more efficient connection with the Pennsylvania at South Wilkesbarre, Pa., which is ultimately to cost some $1,500,000, and on which $237,000 was spent during the year. This involves a new line from South Wilkesbarre, on the Sunbury division of the Erie grand division of the Pennsylvania, to the main line of the Delaware & Hudson at Moosic, 13 miles north of Wilkesbarre. A new interchange yard also is to be established at South Wilkesbarre. This new 15-mile line is shown on the map.

This connection is particularly important to the prosperity of the Delaware & Hudson, especially in anticipation of the time when its own anthracite coal tonnage shall have been exhausted, for it marks the growing importance of a traffic agreement made about two years ago with the Pennsylvania, by which freight destined to New England and Canadian points is received from that road and carried northeast over the Delaware & Hudson line instead of going around by way of New York harbor. The most important item of freight received in this way is bituminous coal, and the effect of the traffic arrangement can probably be seen in the increase from the 904,362 tons of this carried in 1902, by steady gains each year, to 1,657,871 tons in 1906. The tonnage of coke also has increased from 45,897 tons in 1903 to 153,641 tons last year. It will be many years before the anthracite coal deposits of the D. & H. will be exhausted, but when they are, the function of the southern divisions will probably be that of a connecting line for through freight between western Pennsylvania and points west and south thereof, and New England and Canada. All such traffic which can be developed is likely to be specially profitable, for it traverses in the one case half, and in the other case the whole of the company's through line, and gives it an element of strength in through traffic which, as a largely local road, it has always lacked.

The suspension of work at the mines for six weeks during April and May alone prevented the company from showing the largest earnings in its history in all departments. The *net* income for these two months was less by $1,120,000 than for the corresponding months of 1905—a suggestion of the loss. Although the amount of coal produced was 5,400,000 tons, against just short of 5,700,000 tons in 1905, and gross earnings of the coal department were $18,570,000, against $20,200,000 in 1905, the decrease in railroad earnings from transportation of coal was more than made up by increased merchandise and passenger traffic, so that railroad gross earnings were over $17,000,000, larger by more than $600,000 than in the record year 1905. The decrease in coal freight earnings was $224,000, the gain in passenger earnings $214,000 and in merchandise freight earnings $672,000. Railroad operating expenses rose to a new high record, $10,670,000, an increase of nearly $500,000 over 1905. The operating ratio, however, increased only slightly.

Owing to the custom of giving brief returns of operations by divisions, it is possible to get a much clearer idea of the traffic than if the whole were lumped in total figures. This is particularly of interest in the passenger earnings. The Delaware & Hudson has had to meet the competition of electric railways on both the southern and northern sections of its line. Its most profitable passenger territory on its Pennsylvania division is that between Wilkesbarre and Scranton. The Lackawanna & Wyoming Valley, a Westinghouse third rail, high speed interurban line, was put in operation at the end of 1903 between these two cities, and has seriously affected the earnings of the steam road. A reduction of nearly one-half in passenger fares was made to meet this competition, and in 1905 there was an increase in passenger earnings on the Pennsylvania division, but last year on this one alone of the four divisions passenger earnings were less than in 1905.

In the rich passenger territory in New York State about Albany, Saratoga and Lake George the company has taken the bull by

the horns by large purchases of electric railways. In 1905 the Schenectady Railway, operating the lines in that city, was acquired jointly with the New York Central. In 1906 the entire capital stock of the United Traction Company, which operates the electric lines of Albany, Rensselaer, Troy, Watervliet, Cohoes and Waterford, N. Y., in all 82 miles, was acquired, and this company later bought the Hudson Valley Railway, the most important long-distance electric competitor of the Delaware & Hudson, with 130 miles of high-speed lines running from Albany, Troy and Saratoga north to Lake George. As no new company has any reasonable chance of securing an entrance to the territory about Albany and Troy except over the United Traction lines, the Delaware & Hudson, probably with the New York Central as a close ally, now has complete control of the electric development of that territory.

Including all freight traffic, there were only 215,346 more tons carried than in 1905, a small addition to the previous year's total of over 18,000,000 tons. The average rate received per ton, however, increased nearly 1.7 mills, which largely accounts for the increase in total freight earnings. There were small increases in the freight earnings per train mile and in the trainload, which latter rose from 455 tons to 460 tons. Over 24 tons were carried in each loaded car. This high trainload and carload for a road so much of whose interests are local is, of course, due to its heavy and steady coal traffic.

Maintenance of way expenditures per mile of road were less than they were two or three years ago, due no doubt to completion of certain particularly heavy improvements. Per mile operated, excluding trackage, they were $1,778 last year, against $1,869 in 1905, $2,206 in 1904 and $2,018 in 1903. There was, however, $885,000 charged to income for maintenance of way betterments. Under maintenance of equipment account, per unit of equipment, repairs of locomotives cost $1,917 in 1906, $1,886 in 1905, $1,744 in 1904 and $1,186 in 1903; repairs of passenger cars, $311 in 1906, $377 in 1905, $381 in 1904 and $321 in 1903, and repairs of freight cars, $55 in 1906, $58 in 1905, $43 in 1904 and $41 in 1903. In 1906, $1,592,683 was charged to income for equipment expenditures. The unit maintenance figures are not in themselves remarkably liberal, but liberal maintenance of the property is gained by annual large appropriations out of earnings for betterments, the total of which, last year, including the coal department, were $4,259,666, against $4,168,699 in 1905. This includes $238,338, the regular sinking fund of 5 cents a ton on coal produced. The good condition of the railroad lines may be judged from the fact that the installation of automatic block signals has been steadily under way since 1904, and since that time 253 miles of track, which includes 113 miles of double track, have been so equipped at a cost of $626,000. This, with work now in progress and to be finished this year, will cover the whole main line and the two most important branches. On completion of double-tracking now under way, the main line will be double-tracked from Wilkesbarre to Mechanicsville, 217 miles, and from Albany to Whitehall, 78 miles, in all 295 miles of double track.

In view of the present serious criticism of American railroads for their killing of passengers the record of the Delaware & Hudson in this respect during the last 12 years is given. In this time about 75,000,000 passengers have been carried, with three passenger fatalities, all of which occurred in the same accident, which was due to an engineer's running past a signal. The Susquehanna division, with 233 miles of line, has been in operation more than 30 years without any passengers at all being killed.

The results of the year's operation are summarized below:

	1906.	1905.
Mileage worked	843	843
Coal freight earnings	$6,665,732	$6,889,765
Merchandise freight earnings	6,949,898	6,277,855
Total freight earnings	13,682,232	13,233,954
Passenger earnings	3,299,337	3,014,840
Gross railroad earnings	17,050,029	16,382,074
Maint. way and structures	1,388,884	1,459,345
Maint. of equipment	2,016,386	1,884,725
Conducting transportation	6,504,653	6,094,763
Railroad operating expenses	10,670,628	10,183,960
Railroad net earnings	6,379,401	6,198,114
Gross earnings from all depts.	36,669,235	37,331,629
Net earnings from all depts.	8,331,278	7,695,923
Net income	5,156,138	4,679,594

NEW PUBLICATIONS.

Proceedings Fourteenth Annual Convention, Traveling Engineers' Association. W. O. Thompson, Secretary, Oswego, N. Y. 414 pages. Leather.

The last convention of this association was held at Chicago in August, 1906, and it appears that it is following in the footsteps of the Master Mechanics' Association in a way, as indicated by the general range of the subjects that were presented, though they deal more directly with the methods of operation than of construction. At this last meeting papers were presented upon the Drafting of Locomotives; the Latest Methods of Tonnage Rating; the Handling of the Air-Brake in Passenger Service; the Walschaert Valve Gear, and Oil Burning Locomotives. In view of the recent work at Purdue the paper on drafting is interesting principally from the records of road tests that it contains, rather than for the amount of data given or because it will serve as a guide for practice. The other subjects are handled from the standpoint of the engineer and relate to the details of the several topics. Reports were also presented on the Care of Locomotive Boilers at Terminals; the Air-Brake; the Future Engineman and Regularly Assigned vs. Pooled Engines. The last seems unlikely to ever see the end of the discussion upon it. The position taken by the committee making this report is that pooled engines are less likely to be well cared for than those that are assigned, and that it is well not to resort to the pool except where time and freight are crowding and it is necessary to keep the engines moving all of the time, or where the enginemen's contracts require that they shall be run out in turn. The other reports are full of practical suggestions of value to the maintenance and operating departments, and this is especially true of the one on the Care of Locomotive Boilers at Terminals.

Light Locomotives. Published by the American Locomotive Company, New York. 6 x 9 in.; 32 illustrations; 76 pages.

This booklet, which is uniform with the others which have been issued describing separate types of engines built by this company, illustrates and describes small locomotives driven by steam or by compressed air for special service to which ordinary road or yard engines are not suited. It presents types adapted to the use in contractors' work, mines, logging roads, plantations, industrial plants and any service where light rails, poor roadbeds and small clearance must be taken into account. The usual weights and dimensions of each type illustrated are given. Three compressed air locomotives are described. The advantages of this form of motive power lie in its safety in mines, where an explosion of gas must be guarded against, and in its small clearance. This security against fire also creates a demand for the engines for plantation service, where, at certain seasons of the year, the fields are so dry that there is constant danger of fire. The cost of installation of the air compressors is about the same as that of installing an electric traction system of the same size, but the cost of operation of compressed air motors is less. There is a saving in maintenance cost as compared with steam locomotives, in that there are no boiler tubes and staybolts to be renewed.

Three Acres and Liberty. By Bolton Hall, assisted by R. F. Powell, Superintendent of the Vacant Lot Cultivation in Philadelphia, with an introduction by George T. Powell, of the Agricultural Experts' Association. The Macmillan Co., New York, 1907. 435 pages; 5x7¾ in.

This quite unusual book is designed to show the city dweller how he can support himself in the country; what a little farm costs; where to go, what to raise, and how to do it. The study is made along purely practical lines, and is exceedingly interesting and instructive.

CONTRIBUTIONS

Capitalization Reckoned on a Ton-Mile Basis.

New York, April 16, 1907.

To the Editor of the Railroad Gazette:

The subject of capitalization of transportation companies is one of the live questions of the day. For the sake of comparison between properties located in the same section of the country, it is generally conceded that an impartial analysis is made upon a mileage basis. Is this, in fact, a just way of making comparisons?

It would seem that there is a great similarity between a transportation company and an industrial concern. Both are manufacturers. The former enhances the value of goods through transportation from the place of production to the place of consumption; the latter enhances the value of goods by converting them from a crude state into a finished state, ready for transportation.

When figuring his cost of production and probable profit, the manufacturer takes into account the quantity of goods produced. The larger the output the smaller the relative amount of fixed charges per ton.

It would seem that a railroad would be equally justified in applying the same method of calculation. In the latter case the more ton-miles per mile of road (that is the greater the volume of traffic) the lower its fixed charges will be per ton-mile (the commodity produced by a transportation company).

For the purpose of emphasizing the above argument, the following two properties are being compared for the reason that they are located in the same section of the country.

	Year ending June 30, 1905.	
	Mo., Kan. & Tex.	Kan. City Southern.
Average mileage operated	3,043	827
Ton-miles per mile of road	460,359	1,061,064
Fixed charges	$4,924,795	$1,131,900
Per ton-mile per mile of road	35 cts.	13 cts.

It makes some difference whether the interest charges of a corporation are at the rate of 4 per cent. per annum, or whether the

company's debt consists of 3 per cent. bonds, but the principal item of the calculation is the volume of business transacted in each case (in other words the freight density).

Both companies are now paying 4 per cent. dividends on their preferred stock, and by applying the same method of calculation, the M., K. & T. increases its charges per ton mile per mile of road by 4 cents, and the Kansas City Southern by 10 cents. This makes an aggregate charge of 39 cents for the M., K. & T. and of 23 cents for the Kansas City Southern; a difference of 41 per cent. in favor of the latter.

Suppose, for the sake of argument, both roads were paying 4 per cent. dividend on their common stock. In that case the M., K. & T. would add 18 cents and the Kansas City Southern 14 cents to fixed charges per ton-mile of road. The aggregate charges would then be 57 cents for the M., K. & T.; 37 cents for the Kansas City Southern. Once more a difference of 35 per cent. in favor of the latter.

These deductions lead me to believe that it is not fair to compare the capitalization, also fixed charges and other disbursements on a purely mileage basis. It seems to me that due consideration should be given to the volume of business transacted by a company.

D. G. BOISSEVAIN.

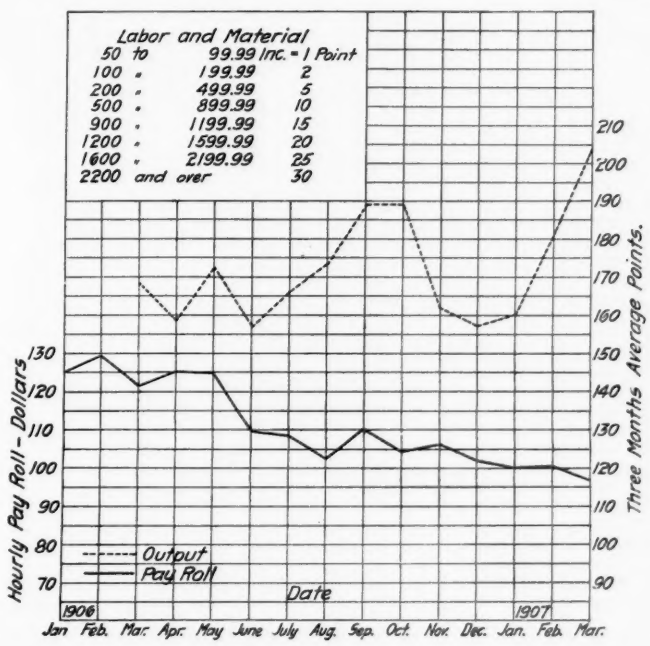
Shop Output.

Fort Madison, Iowa, April 8, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The main essential to a well organized mechanical department is to have the correct data promptly furnished to the man in charge; and in such a form that he may see at a glance the condition of his various shops.

Payroll and output are the important factors. The attached


Labor and Material
50 to 99.99 Inc. = 1 Point
100 " 199.99 2
200 " 499.99 5
500 " 899.99 10
900 " 1199.99 15
1200 " 1599.99 20
1600 " 2199.99 25
2200 and over 30
Hourly Pay Roll - Dollars
Three Months Average Points.
Output
Pay Roll
Date
1906
1907
Jan Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar.

Graph Showing Pay Roll and Engine Output.

graph, which is self-explanatory, furnishes the necessary information concerning engine output. The hourly payroll, represented by the lower line in the graph, is obtained by dividing the total roll of the month by nine or ten hours, as the case may be, for each working day of that month. By this method the "overtime evil" results in a high hourly roll. Each engine turned out during the month is given a value in credit points according to total cost of repairs, and the total points for that month are averaged with those of the two preceding months to determine output line, or the upper line in the graph. One will readily see that there is no cause for complaint when the distance between the two lines is becoming greater. An increase in payroll should result in an increase in output. If one of these graphs, on the same scale, is furnished for each shop, the Mechanical Superintendent is enabled to make comparison between his different shops.

I attach two forms which make a good output report, and from which the graphs are made up.

G. D. SIEMANTEL.

..... *Engine Output.* ..... *Shop, March ....*, 1907.

Eng. No.	Date Out of service.	Date In shop.	Date In service.	Days deten.	Cost of Labor.	Cost of Material.	Cost of Total.	Class reprs.	Points
65.	2/4	2/4	3/9	32	$529.96	$654.06	$1,184.02	H	15
180.	2/5	2/12	3/5	28	107.88	30.64	138.52	L	2
267.	1/29	2/9	3/21	50	637.14	632.90	1,270.04	G	20
287.	1/19	3/6	3/31	69	442.60	468.47	911.07	H	10
398.	3/14	3/14	3/21	7	130.09	508.82	638.91	H	10
507.	2/28	3/5	3/9	9	85.26	276.52	361.78	L	5
511.	2/25	2/25	3/8	11	130.07	19.96	150.03	L	2
517.	3/17	3/17	3/24	7	49.70	2.93	52.63	L	1

American Railroads Not Overcapitalized.

New York, April 12, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As supplementing my letter printed in your issue of April 5, a comparison of the capitaiization of European railroads indicates that the railroads of the United States have issued very much less capital per mile than those of European countries, as clearly shown by the following figures which are copied from a report on the transportation routes and systems of the world, issued by the Department of Commerce and Labor, Bureau of Statistics, Washington, D. C.:

	Year.	Capital or cost per mile of railroad.
United States	1904.	$55,261
Canada	1904.	60,504
Uruguay	1899.	52,756
Venezuela	1904.	70,972
Germany	1903.	98,443
Austria	1903.	128,334
Hungary	1903.	74,056
Belgium (State roads only)	1903.	160,893
France	1902.	137,601
Switzerland	1903.	104,969
United Kingdom	1904.	272,737
Russia	1902.	78,553
Finland	1902.	32,189
Norway	1904.	38,371
Sweden (State railroads)	1904.	44,669
Sweden (private railroads)	1902.	22,006
Italy	1902.	108,212

The capitalization of the railroads of a number of countries in addition to those mentioned above are given in this report, which also states that the average capital or cost per mile of the principal railroads of the world as given is $77,730 a mile. The cost of the railroads in the United States as given, $55,261, could be increased about $10,000 a mile were the stock owned by railroads in other companies not excluded.

It would appear that the capitalization of the railroads of this country is over $20,000 a mile less than the average of the principal railroads of the world, and as this $20,000 amounts to over 35 per cent. of the total capitalization of the railroads of this country, it is important.

In considering the capitalization of railroads, it is always well to remember that in building a railroad the bonds are sold for what they will bring—possibly as low as 60, again on a strong property they may bring over 100 or above par, but in many cases in addition to selling bonds at a very large discount a bonus of stock has been added. Were not practices of this kind resorted to only the most profitable of the railroad propositions could be carried out, and the capital for many desirable improvements or new railroads could not be raised because it would not be possible to issue their securities at par.

The Interstate Commerce Commission in its report for 1905 shows that the total net income available for dividends on the railroads of this country was $373,263,523, and there were declared as dividends $188,175,151, leaving $185,088,372 available for improvements, adjustments or for the support of lines showing a deficit, and as the total amount of capital stock of the railroads of the United States is given as $6,680,473,280, their total earnings available for dividends amounts to 5.58 per cent. on the stock, and the amount of dividends actually declared amounts to $2.82 per cent.—surely not an excessive amount and the amount of money devoted to improvements out of earnings or set aside as surplus or for the support of weaker lines amounts to 2.77 per cent. on the stock. Practically all of this latter sum adds to the money invested in the railroads against which no capital is issued and tending, in a few years, to make the actual investment in money equal to the

..... *Engine Output. Summary, March ....*, 1907.

Date.	Light: Under $100. No.	Light: Under $100. Average Days detention.	Light: Under $100. Average Cost, repairs.	Light: Over $100. No.	Light: Over $100. Average Days detent'n.	Light: Over $100. Average Cost, repairs.	Heavy. No.	Heavy. Average Days detent'n.	Heavy. Average Cost, repairs.	General. No.	General. Average Days detention.	General. Average Cost, repairs.	Totals. No. Lghts.	Totals. No. H & G.	Totals. No. Totl.	Points. For month.	Points. Av'ge 3 mos.	Payroll. Hourly.	Payroll. Total.
Oct., 1906	3	6.0	$71.33	12	12.0	$290.26	1	21.0	$1,150.56	2	39.5	$1,314.37	15	3	18	112	89	$101.58	$24,673.94
Nov., 1906	2	5.5	88.05	6	13.0	285.08	6	27.5	795.38	2	45.5	1,222.29	8	8	16	128	104	105.41	23,716.13
Dec., 1906	3	6.7	77.53	8	18.7	292.67	4	22.2	636.91	1	50.0	1,317.97	11	5	16	107	116	104.11	23,480.32
Jan., 1907	5	6.0	76.73	10	19.0	266.90	7	24.5	804.09	0	....	.....	15	7	22	123	119	103.35	24,180.76
Feb., 1907	6	4.4	57.17	13	9.8	177.08	3	28.3	1,032.81	0	....	.....	19	3	22	84	105	106.04	22,000.27
Mar., 1907	25	2.6	71.94	14	10.6	186.76	7	34.2	944.76	3	61.2	1,447.37	39	10	49	218	142	101.90	23,830.00

amount of the outstanding securities of any railroad, even though they were issued at a very large discount and a stock bonus was given. Besides this gain is the natural increase in the value of the properties, amounting to possibly 4 or 5 per cent. a year, and in many cases, where terminals in large cities have been acquired, they could not be duplicated for any consideration; their present value being many times greater than their original cost to the railroad company.

There is little doubt that from these two causes any water that there may have been in the capitalization of American railroads has been very much more than made up, and that their value to-day is greater than their present capitalization, and that they could not be replaced or duplicated without greatly exceeding the present capitalization.

That the capitalization of the American railroads has not affected their charges for transportation of freight is in a measure indicated by the following comparisons:

Average Railroad Freight and Passenger Rates of the United States Compared with those of European Countries.

Country.	Year.	Railroad freight rate per ton per mile.	Railroad p's'ger rate per passenger per mile
United States	1905.	0.766 cts.	1.962 cts.
Germany	1904.	1.352 "	0.992 "
France	1904.	1.428 "	1.133 "
Austria	1904.	1.503 "	.....
Russia, European	1903.	1.018 "	0.722 "
Russia, Asiatic	1903.	1.157 "	0.458 "
England(Untd Kingdm)	1903.	2.160 "	.....

These figures were obtained from the Department of Commerce and Labor, Bureau of Statistics, and are from the British Statistical Abstract of Foreign Countries, published by the Board of Trade, London, the Interstate Commerce Commission and the London *Statist*. The Board of Trade figures as to the English railroads not giving the average rate per ton per mile, the figure used, 2.16 cents, was found by using the average haul of English railroads assumed by the London *Statist* to be 24.86 miles.

The figures show quite clearly that the railroad freight rates in foreign countries are about twice as great as those in effect on the railroads of the United States. The passenger rates in this country, however, are very much higher than the European rates. Assuming that the rates in Germany are about an average of the European rates and that they had been obtained by the railroads of the United States, our freight earnings for 1905 would have been increased $1,109,841,221, and our passenger earnings would have been decreased $233,747,545, making a gain in net earnings of $876,093,676, or enough to have paid 13.11 per cent. on the $6,680,473,280 stock of the railroads of the United States. This vast saving in money to the people of this country amounts to $10.53 for each of the 83,143,000 people of the United States. The railroad rates in European Russia appear to be lower than those of other European countries, and had they been obtained by the railroads of this country our freight earnings would have been increased $477,304,264, and our passenger earnings decreased $298,790,340, and our net earnings increased $178,513,924, or enough to have paid a dividend of 2.67 per cent. on the total stock of the railroads of this country.

Of course it is fully realized that the very high European freight rates could not have been obtained by the railroads of this country, and that if our rates had been held up to the European average, the business of the country would not have been developed. Does this not bring us back to the fact that the very low railroad freight rates in the United States have, to a great extent, caused or brought about the vast development of this country? Clearly, these conditions do not show the necessity for any feeling on the part of the American public towards its railroads other than the most kindly. The very low European passenger rates are largely due to the dense population and to the low rate of pay of the laboring classes.

C. S. SIMS.

Superelevation.

New York, April 13, 1907.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The communication in your issue of April 12, entitled "Fallacies of Superelevation," seems to merit some attention because of the assumption, which one meets quite frequently of late, that the object of superelevation is to generate a *centripetal* force intended to balance the centrifugal force of trains moving on curved track. It may be worth while to call attention to the fact that this assumption is a fallacy.

The correct statement would be to say that the object of superelevation is to place the plane of the track normal to the resultant of the force of gravity and the centrifugal force, acting on the train. Assuming that this be accomplished, the element of centrifugal force, acting in the plane of the track, is wholly eliminated from the problem of lateral pressure against the outer rail, and we have to deal only with pressures and frictional resistances due to deflecting the wheels from the straight line in which they tend to move to a curved line.

The conception that the object of superelevation is to provide an inclined plane of such inclination that the tendency of the train to slide down it shall be sufficiently in excess of friction to balance the centrifugal force is wholly wrong.

It is true that superelevation performs practically the same service as would a centripetal force in counteracting the effect of the centrifugal force; but the analogy stops here. S. W.

March Railroad Law.

The following abstracts cover the principal decisions in the federal courts during March:

Automatic couplers.—The federal statute requiring automatic coupler equipment on cars moving interstate commerce is violated when such equipment although attached to cars as commanded is so defective and out of repair as to make it necessary for men to go between the ends of the cars to make the couplings. The same liability to the statutory penalty is incurred where the parts of the coupler, although in perfect condition, are not connected. United States vs. Great Northern Railway Co., 150 Fed. Rep. 229.

Maintenance of flagmen.—The duty of a railroad company to maintain a flagman at a crossing is not to be inferred alone from the fact that it runs its trains over the crossing at a high rate of speed. Latham & Long Island Railway Co., 150 Fed. Rep. 235.

Construction of Pennsylvania statute as to injury to employees.—Pennsylvania has a statute which provides that where any person shall sustain personal injury or loss of life while engaged or employed on or about the roads, works, depots and premises of a railroad company or on or about any car or train therein or thereupon, of which company such person is an employee, the right of action and recovery in all such cases against the company shall be only such as would exist if such person were an employee. It is now decided that this statute is without application to an action for the death of an employee of one railroad company while rightfully using the tracks of another company and the catastrophe is caused by the negligence of the emplyees of the latter company. Baker vs. Philadelphia & Reading Railroad Co., 149 Fed. Rep. 882.

Dismissal of condemnation proceedings.—Under Tennessee rule of procedure a railroad company, having appealed in condemnation proceedings, may not after judgment on the appeal dismiss the proceedings as to a portion of the land sought to be condemned on the sole ground that in its opinion the damages assessed were too high. Union Railway Co. vs. Standard Wheel Co., 149 Fed. Rep. 698.

Burden of proof of injury to passenger.—It is a rule of law that the burden of proof of negligence is always on the plaintiff and it cannot be shifted to the defendant without showing that the injury in question was caused by some person or thing connected with the carrier's railroad or business of transportation. The court of appeals of the third circuit applies the rule in a case of injuries to a passenger struck by a missile coming through a window near which he sat. The plaintiff's evidence was that the missile came from the side next a passing freight train, that it was a bolt with a nut on the end of it and that such bolts were largely used in building ordinary freight cars. On the other hand there was evidence that the missile was thrown through an open window on the opposite side of the car by one of several boys who were pelting the train as it went by. It was concluded that the evidence as to whether the missile came from a source for which the carrier was responsible was unsufficient to sustain a verdict in the plaintiff's favor. Pennsylvania Railroad Co. vs. McCafrey, 149 Fed. Rep. 404.

Safety appliance law.—The safety appliance law is violated where an interstate carrier hauls cars considerably damaged by derailment so that the coupling devices are nearly gone for nearly 400 miles past three or more places where repairing is done, in order to make the repairs at larger and better equipped shops. United States vs. Chicago, Milwaukee & St. Paul Railway Co., 149 Fed. Rep. 486.

Reasonableness of rates.—A schedule of railroad rates established by state authority is not unreasonably low as to a particular road because it will not enable the company to accumulate from its net earnings a sinking fund for the payment of its indebtedness. Houston & Texas Central Railroad Co. vs. Storey, 149 Fed. Rep. 499.

Sleeping car companies.—A sleeping car company is not a common carrier of passengers. Its liability to persons seeking its accommodations rests solely on the breach of its implied obligation to furnish such accommodations as it holds itself out as offering to the public. It follows that the agent of a sleeping car company is without authority to inform a prospective passenger that his railroad ticket entitles him to ride without validation as required by its terms. Calhoun vs. Pullman Palace Car Co., 149 Fed. Rep. 546.

Employers' liability act.—The employers' liability act of 1906 is prospective only in its operation and does not apply to causes of action existing at the time of its enactment. Hall vs. Chicago, Rock Island & Pacific Railway Co., 149 Fed. Rep. 564.

Recovery of excess charges by consignee.—The circuit court of appeals of the seventh circuit decides that a consignee who after accepting perishable freight with a full knowledge of the facts.

paid without objection the charges of the carrier, including a charge for icing in transit, in addition to the published tariff rate for transportation cannot thereafter recover back the icing charge on the ground that it was illegal. Kundsen-Ferguson Fruit Co. vs. Chicago, Minneapolis & Omaha Railway Co., 149 Fed. Rep. 973.

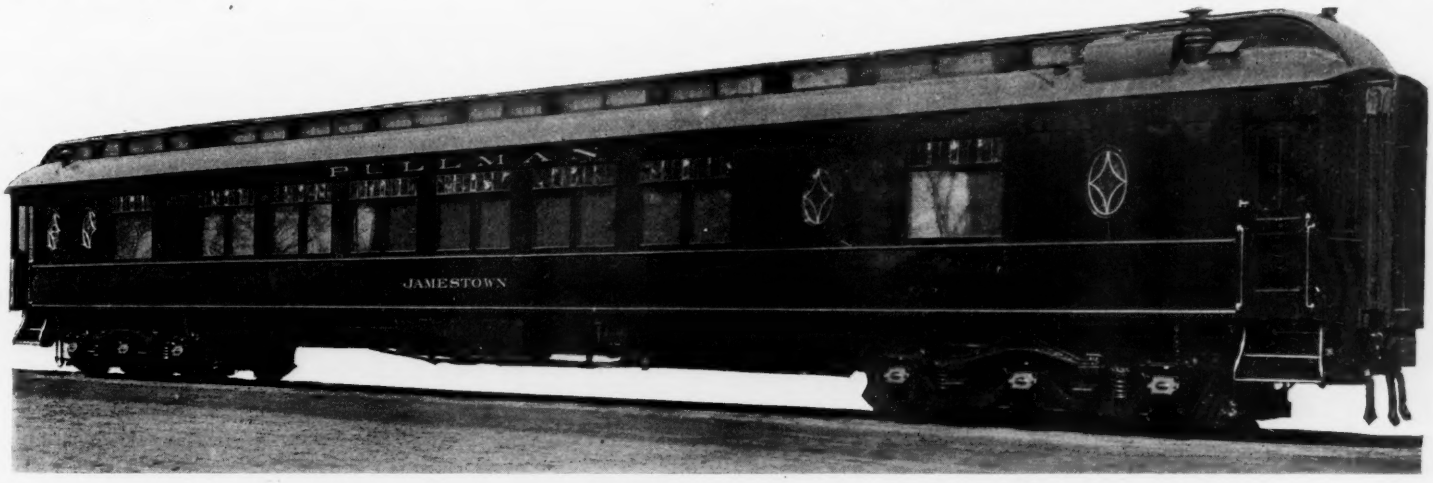
Passes.—The federal anti-pass law does not have the effect to invalidate a contract previously made by a railroad company with an injured person to issue him a free pass for his natural life. Neither does the statute authorize the railroad company to refuse to issue such passes beyond the boundaries of the state. Mottley vs. Louisville & Nashville Railroad Co., 150 Fed. Rep. 406.

Express companies are common carriers.—Under the South Dakota statute providing that every one who offers to carry persons, property or messages is a common carrier of whatever he offers to carry, an express company offering to carry money for hire is held a common carrier and subject to the rules of liability applicable to other carriers. The law gives this character to the business whether the express company is incorporated or not. Platt vs. Le Cocq, 150 Fed. Rep. 391.

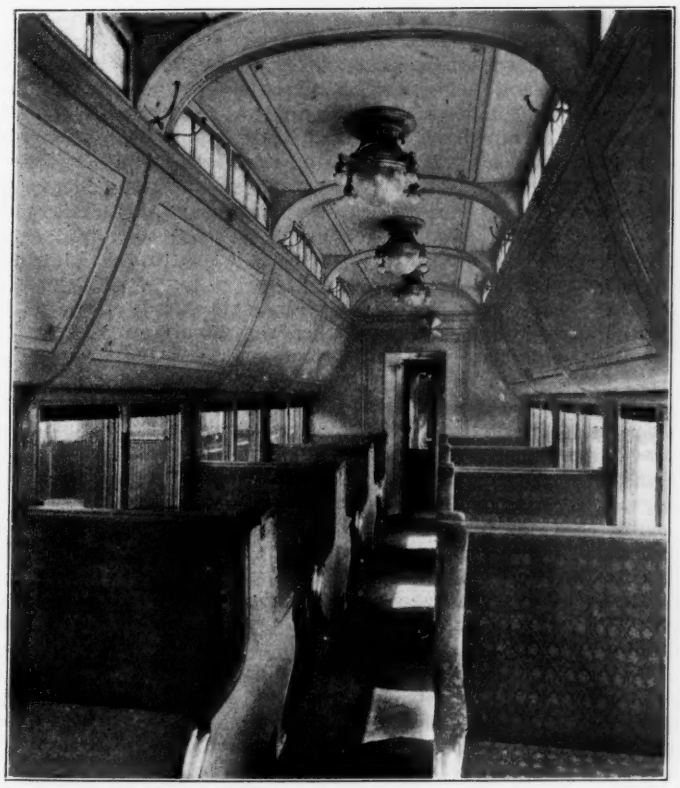
All-Steel Pullman Sleeping Car.

The Pullman Company has built a sleeping car that is as near all-metal construction as is now practicable to make it. In general arrangement as well as in appearance it corresponds to the present standard twelve-section car, except for the rectangular windows and the smooth outside finish. The framing is composite structural steel and the inside finish includes paneled steel and aluminum, brass and composite board.

The center sills are 15-in. I beams, with ½-in. top cover plate, which extend through the body end sills. Each beam is trussed with a 1⅞-in. truss rod. The bolsters, which are the usual double type, are cast steel, being part of one large casting which includes the draft sills, platform beams, body end sill, center and side bearings and bridge. The platform end sills are cast steel, riveted to this larger casting. There are four cross ties or bearers of cast steel, which pass under the center sills. Floor beams formed of 4-in. channels with flanges downward are placed between crossbearers and between the latter and the bolsters. The side sills are 6-in. x 6-in. x ½-in. angles and form the lower members of the side girders. The web of each girder is a ¼-in. steel plate, spliced in three lengths, continuous from end to end of car, and forming the side sheathing of the car below the windows. The rivets are countersunk and filed to a smooth finish. The depth of the side girder is about 30 in. and its upper member is a 3-in. steel bar secured to the side posts. These members are 4-in. I beams, continuous from side sill to deck sill, the upper part forming the car lines for the lower deck. These posts are offset to clear the side sills, belt rail, plate and other continuous members. There are two posts to the wide piers and a single one for the narrow piers, and their webs are punched full of holes to lessen the weight and form passages for electric wires. The end posts are likewise 4-in. I beams, two in number, secured to the deck sills and body corner post at the top, and to a 4-in. x 4-in. angle, riveted to the body end-sill casting, at the bottom. The deck sill is a T-iron secured to the ends of the side posts, which, as already mentioned, form the car lines of the lower deck. The upper deck car lines are $^1/_{16}$-in. pressed steel, of channel section, and also form the deck posts at the wide piers. At the narrow piers the deck posts are flat bars. The purlins are



All-Steel Sleeping Car "Jamestown" Built by the Pullman Company.



Interior of Pullman Steel Sleeping Car.

similar in form to the upper deck car lines. The roof covering is galvanized iron with copper flashing, and the hood covering is copper.

The floor is ¼-in. steel plates with corrugated galvanized iron above and 1 in. of hair felt between. Monolith floor covering is laid on the galvanized iron, and on this, in the passageways, men's saloon and smoking room, rubber tiling. Between sheathings, in the sides and ends of the car, extending from side sills to plates, are two thicknesses of asbestos board to deaden noise and provide insulation.

The inside finish of the ceiling of the upper deck is aluminum and of the lower deck composite board; in the hallways, saloons and annex and ladies' toilet room it is steel. The seats and backs have steel frames, and the ends are steel and brass. The upper berths are pressed steel. The window frames are brass. The interior is painted a light gray and the decoration is in gold and colors. The seat covering is old rose velvet and the floor covering old-rose Wilton carpet. The lighting fixtures are combination electric and Pintsch gas mantle lamps for the ceiling, and electric bracket lamps for the berths. The car is wired for the axle-light system. It is mounted on six-wheel cast-steel trucks, these and the other cast steel members already mentioned being furnished by the Commonwealth Steel Company.

The car has been on private exhibition at several points and is said to ride comfortably and with little noise. It is named "Jamestown" and will be exhibited at the Jamestown Exposition.

Foreign Railroad Notes.

The protest against the baggage charges of the German uniform passenger tariff, which is to go into effect April 1, led to its modification. As given in the *Railroad Gazette* of Feb. 15, rates were to be charged for every 25 kilograms and for every "zone." By the change the rates are lowered for 25 kilograms or less (the

allowance of free baggage heretofore in the North German states). The charge of 20 pfennigs, which by the original scheme applied only to the zone one of 25 kilometers or less, is made to cover zones one and two, that is, all distances up to 50 kilometers, and the charge of 50 pfennigs which originally applied only to distances from 50 to 100 kilometers, will be good for all distances up to 300 kilometers. A mark will pay for all greater distances while originally it was to pay only for 200 kilometers or less; and for more than 800 kilometers 5 marks were to be charged. There is also introduced a weight over 25 kilograms up to 35 (77 lbs.), and for this the charges are those originally made for 25 kilograms, as we published them. Greater weights follow the original tariff, that is, will be higher—for long distances much higher—in proportion than the charges for 25 kilograms.

The European international syndicate of manufacturers of rails has been renewed for five years.

The French railroads in 1906 earned 4.4 per cent. more than in 1905, which is an unusually large increase, though small in comparison with gains of railroads in countries of large coal and iron production.

Economics of Railway Location.*

The committee on economics of railway location was formed for the consideration of all questions connected with railroad location, grades, lines and improvements of grades and lines affecting the economic operation with relation to traffic, tonnage ratings, speed, density of traffic and financial considerations, with the special aim in view of establishing uniform methods and unit values for investigating and analyzing the relative changes and costs of comparative routes or proposed grade reductions and line corrections.

The first report of progress submitted herewith is indicative of the vast field embraced by the scope of work relegated to its consideration, rather than as conclusive of any one of the several details set forth in the instructions to the committee.

It will be realized that much of the matter proposed to be investigated depends largely upon the relationship of the financial question and the economics of trade, to the purely engineering features, and that the true economics of the latter depend in a considerable degree upon the results arrived at by experiment.

The conditions under which experiments have hitherto been made, as well as those at present governing actual practice on the existing lines, are so varied, that, without further investigation, your committee is, as yet, unable to formulate or definitely recommend any set rules or empirical formulas that will accurately cover any of the sub-features embraced in this province of its work.

Generally, and with special reference to the work of this committee, it may be said without question that, viewed from a modern standpoint, much of the railroad construction in the early days of the development of the North American continent was of an inferior character. Great distances had to be traversed, the population of the country was sparse and scattered, and the gradients and curvature were, therefore, too frequently determined by the amount of money to be expended per mile of road rather than by a consideration of the probabilities for future traffic and the economic value of grade and alinement features.

Commercial progress of the country, however, followed the introduction of the railroad, and the financial problem of how to make a dollar earn most began to receive greater consideration.

For a number of years past, the larger railroad organizations have been spending large sums of money in improving the properties under their charge; but while there has already been an immense outlay in this respect, it may be said confidently that betterments in the future, both in new locations and in revision work, will be on a much greater scale than those of either the past or present.

The general situation necessitating such changes may be said to be the outcome of circumstances. It is due in a great measure to a realization of the saving in operating expenses resulting from such betterments, to the increasing demand for cheaper rates and better service, the competition of railroads with one another, and, more especially, to the construction of new lines designed on better economic principles.

In the effort to reduce train mileage, locomotives and rolling stock generally have been greatly increased in size, weight and capacity; and the effect of such changes has been: bridge structures of increased strength, heavier rails, securer joints, more and better ballast, wider roadbed, and, consequently, an improved railroad.

Besides changes of this nature, however, it soon became recognized that many improvements might be made in the distance, gradients and alinement of the earlier construction which would effect a reduction of train mileage, independent of the class of rolling stock used. The province of this committee is, therefore, to investigate certain economic principles, in order that, eventually, helpful suggestions may be made to railroad engineers and railroad managers engaged in the construction of new lines, as well as of grade and alinement revisions.

It is usually comparatively easy to estimate the cost of a projected railroad or an improvement to an existing one. The actual cost, however, of operating such a line, or the value of the saving in operating expenses which is rendered possible by any proposed physical change in the road or in the method of operating its trains, due to a modification of alinement, distance, or gradients, is more uncertain.

Before the proper location or re-location of a railroad can be decided intelligently, it is necessary that the factors governing its earning power be properly understood, and the relations between the purely engineering and the financial features thoroughly grasped. Railroads are built as commercial undertakings for profit, and a railroad that can furnish the most economical transportation, time as well as money being considered, will finally show the best net earnings.

The three principal factors which affect profits, viz.: gross earnings, operating expenses and fixed charges, are, in a great measure, dependent upon the location of the road with regard to the sources of traffic. With a gross amount of traffic and proper location and construction, the greater the first expenditure (with its consequent improved road) the less will be the operating expenses, but the greater the fixed charges. Increasing one decreases the other. With a given volume of traffic, the economic location is the one in which the sum of fixed charges and operating expenses is the least; and a more economical location is obtained when interest and renewal charges on additional expenditure for construction are saved in decreased operating expenses, or when increased operating expenses are saved in reduced interest and renewal charges on cost of construction. The most economical location is secured when every gain possible has been effected, both by decreased cost in the one case and decreased operating expenses in the other. In grade reduction, it is the saving in number of trains, even if each train costs somewhat more.

The effect of differences in location on such factors must be understood before a proper and economic location can be determined. If it can be computed that by physical alterations in alinement or gradients, or by any change in the method of operating trains, the expense of each train over a proposed line or the number of trains to handle a given traffic can be reduced, then the only problem remaining is the financial study of the relative values of the proposed expenditure and the expected annual saving. A general and purely academic discussion of some features of this question may profitably precede the future consideration of details.

It is often stated that any really meritorious proposition can command the requisite capital, provided that it is properly exploited. Although there is considerable truth in this statement, it is also true that there is a wide difference in the amount of effort necessary to raise money, depending on the status of the corporation making the effort. It is perhaps unfortunate that the financial standing of many railroad corporations is so unlimited, that many changes, which probably could not be justified by any rational method of computation, are recklessly made after slight consideration. There may be little or no reduction in operating expenses and certainly not enough to justify the capital expenditure, but the financial strength of the company is so great that there is no reduction in dividends. There may be an actual increase in dividends, which only means that the financial strength of the road is so great, and is growing so rapidly, that the comparatively insignificant loss, due to fixed charges on an unjustifiable expenditure, is utterly swallowed up. On the other hand, the road which is financially weak must show unquestionable justification for any proposed improvement, and even then the financial reputation may be so limited that a really meritorious project may fail for lack of funds.

There can be no question regarding the justification of providing for traffic that may reasonably be expected for a considerable period after the plans are made.

A railroad is not built for a day's work. There will be an interval of a year or more after the plans are made before the road is built. Several years more may elapse before the normal traffic is obtained. If the increased traffic cannot be economically handled with the facilities provided, then the railroad is confronted with the choice between an uneconomical handling of traffic or an immediate additional expenditure with its accompanying loss and waste of work already done.

Of course, much depends upon the character of the change and the amount of the waste. In territory where the topographical features are extreme and the financial aspect a governing element, cases may arise in new construction in which it is necessary to temporize with the profile in regard to limiting grade; that is, to construct a temporary line with grade steeper than the limiting one, a line which will be used until future traffic conditions war-

*Abstract of a report presented at the annual meeting of the American Railway Engineering and Maintenance-of-Way Association at Chicago, March 19, 20, and 21, 1907.

rant the construction on the alinement as projected. In such cases, in the consideration of the economic value of reducing the grade, it must be taken into account that the cost of any temporary work thrown away must eventually be borne by the permanent line. This fact should emphasize the desirability of avoiding temporary work whenever the finances of the company warrant the immediate construction of the permanent line.

It is conceivable that a considerable improvement may be made by merely heightening a fill in a sag without altering the horizontal alinement. The additional work in this case will cost but little more than it would have cost originally, with the advantage of saving several years' interest on the added cost. In the other extreme it might be necessary to utterly abandon a considerable section of the line, and in such case the road would become perpetually burdened with an interest charge on both lines. The very patent fact that improvements, especially when not planned during the original construction of the road, so frequently require the abandonment of considerable old work the cost of which will be perpetually represented in the fixed charges, causes a delay in the reconstruction for a number of years until the disadvantages of uneconomical operation become so great as to be intolerable.

The possibility of permanently utilizing the temporary line as a branch line, or even as a mere freight track by which to reach factories and other industries, may exclude all permanent loss from the question. It may happen that the line can be used to handle the local traffic, and one more direct for through business built later; the temporary line could then be used as a second track if the gradients are favorable in one direction. In this case one would be enabled to "eat his cake and keep it, too." The cheap temporary line serves its original purpose and saves the immediate construction of the expensive permanent line, and yet both the preliminary and the later expenditure are fully justified by their utilization.

As a practical result, it may be taken for granted that a much heavier traffic is needed to justify the abandonment of a temporary line than would justify the construction of a permanent line designed for heavy traffic.

A very interesting collection of figures has recently been brought to the notice of the committee. The name of the road and the exact location of the improvement need not be stated, but the essential facts and figures are given. A section of the road over 83 miles long was built originally with very sharp curvature and heavy grades in order to reach certain coal fields.

It was considered imperative to reach the coal fields at once, and therefore the construction of an alternative shorter low-grade line was deferred. About two years ago, the low-grade line was completed, at a cost of nearly five million dollars for 59 miles of road. Over 24 miles of distance is saved by the new line. The limiting grade against eastbound traffic has been reduced from 0.91 per cent. to 0.05 per cent. The limiting westbound grade on the old line is 1.15 per cent. On the new line, with the exception of a 0.24 per cent. grade on the approach to a bridge, there is no grade against westbound traffic. The total rise against eastbound traffic was reduced from 687 ft. to 69 ft., and against westbound traffic from 438 ft. to 17 ft. The maximum rate of curvature was reduced from 12 deg. to 6 deg., and the total curvature from 19,783 deg. to 5,075 deg. The average degree of the curve was reduced from 7 deg. 50 min. to 3 deg. 19 min. This required 10,222 ft. of tunnels as against 4,096 ft. on the old line. In this case, however, the old line was not abandoned. It is still used for trains of eastbound empty coal and coke cars. But all the westbound business and also the eastbound time freight passes over the new line. The two lines may virtually be considered as a double-track line.

The results of this improvement are given by a comparison of the business of the year 1904, handled entirely on the old line, and that of 1905 handled on both lines as described above. Notwithstanding an actual growth in business of 22 per cent., the work was done with an economy of 2 per cent. in freight engine mileage, besides the disuse of three pusher engines, with a mileage of 138,816 miles in 1904. Again, in spite of 22 per cent. increase of business, the freight train wages were actually 19 per cent. less than in 1904. On account of the relief of the congestion of the old line, the overtime of the freight trains was reduced from $80,000 to less than $43,000, a saving of 46 per cent. The average time of freight train runs was reduced from 18 hours 28 minutes to 12 hours 35 minutes, a saving of 32 per cent.

After allowing for the increase of 22 per cent. in traffic over the figures for 1904 and comparing these figures with the actual figures for 1905, it was estimated that the saving in operating expenses resulting from the construction and operation of the new line amounted to nearly $238,000, which is nearly 5 per cent. of the total cost of the new line. It is also claimed that the $238,000 does not fully measure the true saving owing to the fact that the old line was already being worked to nearly the limit of its capacity. But even accepting that figure as correct, a saving of 5 per cent. during the first year after construction may be considered a remarkable justification of the construction of the new line.

While the committee realizes that all the facts bearing upon this comparison are not stated, and are not available at this time, nevertheless it considers that what is given may be of considerable interest and value to the members.

In regard to the period for which future traffic should be discounted, by the very nature of the case it varies with the character of the temporary line, the capital which will be wasted in abandoning the temporary line and the probable rapidity of growth of the traffic. It also depends upon the very variable and almost indeterminate annual loss due to uneconomical handling of traffic. Even the temporary line is supposed to be so designed that the existing meager traffic is handled as economically as is justified by such traffic. The growth in traffic is literally a growth, and does not increase by leaps and bounds. The justification of the larger expenditure changes from zero at the beginning of the period to some larger amount at which a change is imperatively demanded. Even the change, although gradual, is not necessarily at a uniform rate. There can be no empirical rule for determining the number of years in advance that it is desirable to provide for, but if the actual tonnage for a considerable period of years is plotted to form a curve, the extension of the curve will give probably the best obtainable prophecy of future traffic. Where changes can be cheaply made afterwards a small number of years seems proper, but where alterations suitable for increased traffic would mean the entire disuse of much expensive work, a much longer period in advance is advisable.

A consideration of the foregoing uncertainties will show that a definite mathematical solution is seldom possible. It would appear as if the question must be finally determined by "judgment," although the judgment should be guided by a careful consideration of all the modifying elements, and each change should be considered by itself even on the same road.

The Nevada Railroad Law.

The legislature of Nevada has passed a comprehensive act to regulate railroad, telegraph and telephone companies and to fix maximum freight charges. There is to be a railroad commission of three members, one of whom, receiving $5,000 a year, must give his whole time to the office. The other two are to receive $2,500 yearly. The commissioners are appointed by a board consisting of the Governor, the Lieutenant-Governor and the Attorney-General, and their terms will be three years. The commissioners must have a general understanding of matters relating to railroad transportation. The appointing board may remove a commissioner, but not until after a public hearing, if the commissioner shall desire one. A complaint made to the commission must be considered within four months and be determined within six months; and a failure to comply with this provision will render the office of each of the commissioners vacant.

The Secretary, who must be a stenographer, is to receive not over $1,800 a year. The commissioners may attend conventions of railroad commissioners, etc., but when outside the state shall not be allowed their expenses.

The term railroad is to include express, telegraph and telephone companies, but the act does not apply to street and electric railroads carrying passengers only within the limits of cities, nor to private railroads not doing business as common carriers; nor to any railroad less than 20 miles long. The foregoing is the substance of the first two sections. Following this are requirements of reasonable service and charges, etc., similar to the requirements of the Federal law. The western freight classification, already in use by the principal roads, shall be adopted by the commission for all the railroads of the state. The commission must see that the following rates for freight are not exceeded: Class one, 8 cents; class two, 7.4 cents; class three, 6.4 cents; class four, 5.2 cents; class five, 4.6 cents; class A, 4.6 cents; class B, 3.6 cents; class C, 3.1 cents; class D, 2.7 cents; class E, 2.7 cents. For carrying ore the commission must keep the rates within the following figures: Rough stone, iron ore, limestone, etc., ½ cent a ton a mile; ores worth $20 a ton, 1 cent a ton a mile. Following this are seven different rates for ores of different values, those worth $1,000 a ton being 2 cents a ton a mile. The commission may make rates lower than those named in the law, but it may permit narrow gage railroads to charge rates 150 per cent. higher than those specified. None of the maximum rates shall apply on any road until it has been in operation two years. Hauls of less than 50 miles may be charged for 50 miles, but for 15 miles or less the rate is to be fixed by the commission. Free transportation is prohibited, with the usual exceptions, including one allowing free transportation or reduced rates to be given to teachers and students. Persons in charge of live stock may be carried free, but there must be no discrimination. Every railroad must furnish suitable cars and when there are not enough cars must distribute them fairly according to the immediate requirements of the applicants. Railroads, as between themselves, and interurban roads, as between themselves,

must make proper arrangements for interchange. The commission shall have control over private tracks used by common carriers.

The sections concerning complaints and the treatment thereof are similar to those of the Federal law. Orders of the commission fixing rates are to take effect 30 days after the date of service and rates made by the commission are to be prima facie lawful for one year and until changed by the commission. The provisions of the commission's orders shall be prima facie reasonable unless suspended in the way prescribed. If rates fixed by the commission are complained of they shall remain in force until final determination by the courts. In all actions against the commission's rates, the burden of proof shall be upon the plaintiff. The commission shall have authority to inquire into the management of all the roads, shall prescribe blanks for reports and may require the production of papers kept by a railroad outside the state, under penalty of $1,000 a day. Every year in January each railroad must report a verified list of all passes issued, but this does not apply to transportation issued to persons not residents of Nevada. Annual reports must be sent in by the railroads by September 15. Illegal rates, rebates, etc., are prohibited as in the Federal law, and the penalty lies against both the carrier and the shipper. The giving of passes to state, county or municipal officers is forbidden, and either the giving or the acceptance of such transportation involves a penalty of $500 fine or six months in jail.

Accidents attendant with loss of human life must be reported at once to the commission and the commission may investigate where the public interest requires an investigation. Claims for overcharge, loss or damage not acted upon within 90 days may be investigated by the commission, which shall make a public report of the results.

Government Report on the Block System.

(*Concluded from page 510.*)

AUTOMATIC BLOCK SIGNALS.

In the early development of automatic signals, track instruments, that is, circuit-closing or circuit-breaking devices having levers placed at the side of the rail as to be moved by the wheels or actuate by the depression of the rails under passing trains—were used to a considerable extent for the operation of the signals. An instrument at the entrance of the block would, as a train passed it, break a circuit and thereby set the signal at that point in the stop position; the instrument at the end of the block, while setting the next signal at "stop" in the same manner as the first, would also close the circuit for the first signal, which would then return to the clear position. Signals operated by track instruments proved, however, to be wrong in principle.

In practical operation it is frequently necessary for a train to pass an automatic signal indicating "stop." This is especially for the reason that, if the signal is out of order and will not clear for an indefinite time even though the block is clear, it is impracticable to detain a train until a repair man can reach the spot and put the signal in order. Since any signal at "stop" may be out of order, it is generally found to be necessary to operate under a uniform rule that a train, after stopping at an automatic signal, may proceed carefully to the point of obstruction or through the block if no cause for the stop-signal indication is found. But if it happens that there is a preceding train in the block, this train, in passing out, where the track instrument is used, is likely to clear the signal in the rear of the second train, which has passed the stop signal and entered the same block with the first. In the same way, if a train parts and the forward portion passes on while the rear portion remains in the block, the signal that should protect the rear will be cleared.

Track-circuit control.—The track circuit is free from the imperfections of the track instrument; it holds the signal at "stop" so long as a car or even a pair of wheels remains on the rails of the circuit, and also, without any added complication, provides for the automatic clearing of the signal when the main track is cleared by a train taking a siding in the block (and after the switch has been set for the main track) and for setting the signal at "stop" and maintaining that indication when a switch is opened when a train enters the main track from a siding, and even when a train backs into the block at the outgoing end. As a result the track circuit is now universally used for the control of automatic signals on steam roads.

Arrangement of signals.—In the typical installation of automatic block signals, each block is of the length of one track circuit—from half a mile to 1 mile. At the entrance to the block a home signal is placed and, lower down on the same post, the distant signal for the home signal at the entrance to the next block. The separate distant arm may, however, be dispensed with and the home signal made three-position; the home arm horizontal then indicates stop, at 45 deg. it indicates that the block at the entrance of which it is placed is clear, but the next home signal is in stop position, and the vertical position indicates that the block is clear and the next signal in a position (45 deg. or vertical) indicating that its block is also clear. Longer blocks, with the signals controlled by two or more consecutive track circuits, are used to some extent. As distant signals more than 1 mile from their home signals would be farther than is necessary to insure safe stopping of trains and would impose an extra burden on the enginemen's memory, it is usual, where the blocks are much more than 1 mile long, to have separate distant signals within the blocks. Fig. 6 shows diagrammatically both short and long automatic blocks.

Switches.—Switches in the blocks control the track or signal circuits by means of simple circuit controlling devices; so long as a switch is not set for the main track the signal for the block in which it is located indicates stop. In addition the side-track rails extending to the point of safe clearance from the main track, are connected with the track circuit so that if cars are left dangerously near the main track the signal is held in the stop position (see Fig. 4).

While the automatic signals give the proper indication if a switch is left open and afford protection to a train that enters the main track from a siding, there is still the possibility that a switch may be set for the siding and a train may start to enter the main track after another train has passed the signal controlled by that switch and before it has arrived at the switch. To meet this contingency electric indicators are, on some roads, placed at the switches and arranged to show the approach of a train from a point some distance in the rear of the nearest signal. It is also provided by rule that a switch must not be moved when a train is approaching, and that, after a switch has been set for the siding (and the signal thereby set at "stop"), the train shall not move from the siding to the main track until a certain time has elapsed, so that any train that may be approaching without the knowledge of the trainmen at the switch, may have time to arrive if it has already passed the signal. The dependence of these provisions upon observance of rules and the difficulty of insuring that such rules shall always be strictly observed, emphasize the importance of interlocking, which will be touched upon later.

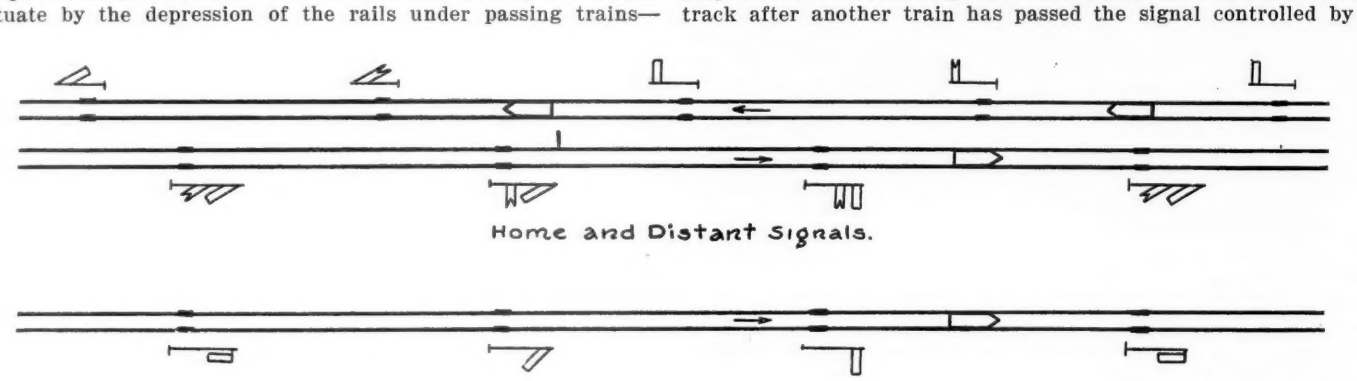


Fig. 6—Two-Position and Three-Position Automatic Block Signals.

Automatic signals on single track.—Automatic signals have been used on single-track roads much less extensively than on double track. Two difficulties are met with in applying automatic signals on single track, which have doubtless prevented their more extended use on such lines. To make the signals efficient in preventing collisions between trains running in opposite directions—in cases of forgetfulness on the part of trainmen, or mistakes in or misunderstanding of orders, the controlling circuits must be more extended and complicated than are those on double track; that is, each of two trains approaching each other must set signals at "stop" against the opposing train, so far in advance of itself as to insure that both trains will receive stop indications in time to stop before meeting. And, in addition, when a train finds a signal at "stop" it must not proceed as it would on double track, merely looking out

for a train standing or moving in the same direction as itself, but must suffer considerable delay by sending a man ahead with a red flag or light, because there is always the possibility that a train may be approaching in the opposite direction. In spite of these difficulties, however, automatic signals are being installed in large numbers on single track by certain roads.

Signals.—Clockwork and inclosed disk signals, as still used on a few roads for automatic block signals, have already been described. Automatic semaphores are worked by compressed air controlled by electro-magnetically operated valves and supplied by a pipe line laid along the track from compressors usually located at water-supply stations; by compressed carbonic-acid gas supplied from portable cylinders delivered and connected to the various signals from time to time, and, like the compressed air, controlled by electro-magnetic valves; and by small electric motors connected by gearing to the operating mechanism and supplied with current from primary batteries or from storage cells. The storage cells may be charged on line circuits from generator stations located at suitable intervals or by primary batteries, or may be handled as portable batteries, taken to the generator stations for charging and returned, charged, to the signals. Storage batteries are also used on some lines to furnish current for the operation of electro-pneumatic signals and for the track circuits.

Automatic signals on electric railroads.—Automatic signals controlled by track circuits are used on a few electric railroads equipped for heavy service. Alternating current is used in the track circuits to render the relays unresponsive to the traction current flowing through the rails. The resulting increase of cost and complexity is considerable, but the signals and mechanism, other than appliances connected with the track circuits, are not materially different from those used on steam roads.

Automatic signals with automatic stops.—In the New York subway and on the Boston elevated railroad automatic train-stopping devices are used. As applied in the subway each trip for the automatic stop remains "set" until the train that operated it has passed far enough in advance, so that any following train that might overrun the trip would certainly be brought to a stop before colliding with the train protected by that trip. This is accomplished by making the length of block a little greater than the distance in which a train can be stopped, and so arranging the circuits that each signal remains in stop position, and the corresponding trip "set" until a train protected by it passes out of the next block ahead; that is, a train always has at "stop" in its rear not only the signal at the entrance to the block in which it is at the moment, but also the next signal back of that, and has never less than one block of clear track behind it in which a following train will be automatically stopped if it is not sooner stopped by its motorman.

The effect of this on the train movement is shown by the upper diagram, Fig. 7, where it is seen that, of two trains in motion, the second must be a little more than three blocks in the rear of the first if it is to find each distant signal clear, as it should if it is to continue running at full speed. With the ordinary arrangement of signals, as shown by the lower diagram, the second train could be one block farther advanced; or, the spacing of trains must be nearly one-half greater when the extra interval of one block is used, and the capacity of the road is proportionately reduced. Of course, it is hardly necessary to say that the almost absolute safety secured justifies the use of the automatic stops and increased train interval in view of the density and character of the traffic and the peculiar conditions in the subway.

False clear signals.—While it is possible for an automatic signal or its controlling devices to become deranged in such a way as to indicate a clear block when the block is occupied by a train, the records show that, with proper construction and maintenance, such failures are very rare. Since they do occur, however, some railroad officers feel that the signals should be subject to constant inspection—that some one on each train should see that every signal passed indicates stop. On a few roads, especially some of the first to install automatic signals, each signal is placed 150 ft. or more beyond the beginning of the track circuit that controls it, as at X, Fig. 4, so that, if it is working properly, it will move to the stop position in the sight of the engineman, and if it fails to move the engineman will at once detect the failure. On many other roads, however, this arrangement has not been viewed with favor, as it is felt that the signals should continue to give the true indication of the condition of the block ahead until passed by the enginemen, and it is believed that most of the few dangerous failures and the conditions that might cause them will be discovered by systematic inspection on the part of the maintenance force.

Reliability of automatic signals.—A vital element of the automatic signal system is reliability. If the signals should fail very frequently, even though the failures were on the safe side, the detentions to trains would become a serious inconvenience and, still worse, the trainmen, after repeatedly finding signals at "stop" when the blocks were clear, would cease to give much weight to the stop indications of the signals. If false clear indications should become frequent the system would evidently be worse than useless. Careful inspection and intelligent maintenance work are essential; for no matter how well constructed the appliances may be as installed, they must deteriorate, and continued efficient service can only be secured by finding and removing faulty conditions before they become the causes of failures.

The records of failures vary among the different roads, and it is probable that different methods of classifying failures and differences in the strictness with which reports of all failures are demanded account for some of the differences in relative numbers of failures given. Aside from this the results will of course depend upon the character of the appliances, the length of time they have been in service, and the quality of the maintenance work. However, the results obtained on several thousand miles of road equipped with automatic signals show very satisfactory working. False clear signals are generally rare; and, since absolute perfection and infallibility in that direction must, in the nature of things, be unattainable, it seems fair to consider that the small number recorded should not weigh against the safety and reliability of the automatic system.

Cost.—While the cost of installation and maintenance of automatic signals are, of course, much greater than for the telegraph block system, the cost of operation is generally much less; for if the average length of block under the manual system were even two or three times that of the automatic blocks the number of telegraph operators required would be much greater than the number needed at junctions and passing places only when the block signals are automatic. The cost of automatic signals is therefore offset, at least in part, by saving in cost of operation, and the advantage of the short blocks in facilitating train movement is so great and the working of the signals so satisfactory that they are favored by a large number of American railroad officers.

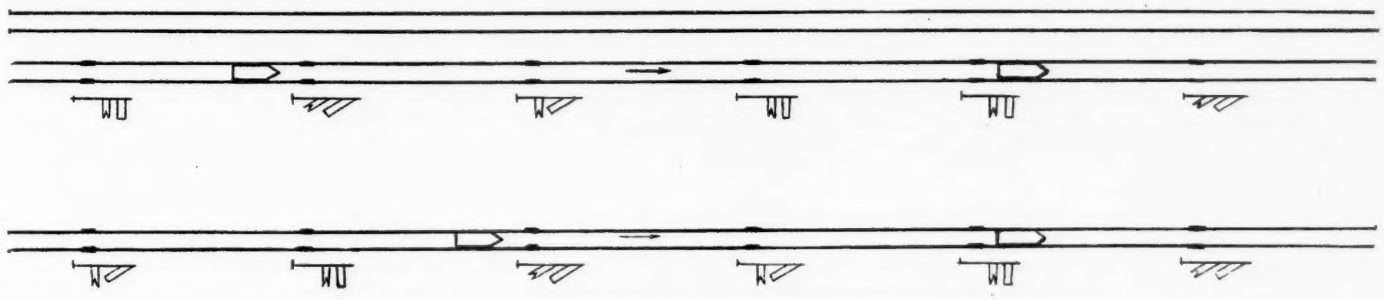


Fig. 7—Automatic Signals in New York Subway.

THE CONTROLLED MANUAL BLOCK SYSTEM.

In the controlled manual block system the signalman is physically prevented from clearing his signal unless the signalman at the other end of the block manipulates his apparatus so as to close an electric circuit and electrically release the signal. Thus each signalman is forced to consult or ask permission of the signalman in advance before clearing his signal.

To guard against possible mistakes of both signalmen at the same time an automatic locking and releasing device, actuated by the passage of trains, is added to the apparatus by which the signalman releases the signal at the entrance to the block in his rear. This is so arranged that each time the apparatus is operated to give a release it automatically becomes locked against a repetition of the operation until a train, having come through the block, passes that block station and by acting upon a device depressed by the wheels or by passing onto and off a track circuit releases the lock. The result is that, even though the signalman should make a mistake and attempt to release while a train was in the block, he would be unable to do so until the train had passed his station.

Appliances.—The appliances required in addition to the signals and means of communication are an electrical block instrument by which the signalman at B, for example, closes the circuit to unlock the lever at A; a lock on the signal lever, sometimes combined with the block instrument; line wires from station to station, and either a track instrument operated by the wheels of passing trains or a track circuit, by which the trains effect the releasing of the

block instrument as they pass out of the block. Additional appliances sometimes used are electric "slots" or tripping devices on the signals by which the signals are automatically returned to the stop position when trains pass, and "continuous track-circuiting"—that is, the connection of the track throughout the entire length of the block into one or more track circuits arranged to keep one of the releasing circuits open, or inoperative, and so prevent the clearing of the signal, so long as a single car or engine is on the rails included in such track circuits.

Operation.—In the most common form of block instrument B unlocks A's lever by pulling the lower knob outward and immediately letting it return to its original position, in which it then becomes locked against a repetition of the operation. At the same time the word "Free," previously visible, disappears from the rectangular opening in the case and the word "Locked," indicating that the operating knob is locked, as just stated, takes its place. The unlocking of the lever at A is shown by the inclined position of the indicator arm in A's instrument. The signal at A is then cleared.

When the train enters the block at A, the words "Train in block" automatically appear at the rectangular opening in B's instrument. B then gets his own lever for the next block unlocked by C and clears his signal for Block B C. While B's instrument continues in the condition in which the words "Train in block" are displayed, the unlocking circuit is open and the operating knob remains locked so that, after A's signal has been returned to, and become locked in, the stop position, in the rear of the train, it is impossible for B to repeat the unlocking and allow that signal to be cleared again until the train has passed out of the block.

When the train passes B, its wheels actuate the automatic release; to insure, however, that the signal at B shall be returned to the stop position for the protection of the train between B and C, before a following train is admitted to the block A B, the circuits are so arranged that the releasing is not completed until B's signal has been so placed. When this has been done and the train, by passing onto and off the releasing track circuit, has caused the track relay to open and close again (so that the releasing is delayed until the last car has passed), the word "Free" reappears and it is again possible to draw out the operating knob for the purpose of unlocking A's lever.

The procedure in operating the controlled manual system is nearly the same as it is for the telegraph block system. A signalman, however, cannot clear his signal in accordance with Rule 318, but must ask for "an unlock;" when an unlock is asked for, if the block is clear, it must be given by the proper manipulation of the block instrument. It is common practice to use electric bells for the ordinary communications in the working of the system.

Imperfection.—Although this is an accepted form of controlled manual apparatus and is the one most largely used in America, the fact should not be overlooked that it has one weakness. That is, if a train parts in the block and the forward portion passes out while the rear stops in the block, or if a train is admitted to a block occupied by a preceding train (and this is sometimes necessary in the case of a train stalled or otherwise detained for an unusual time), the one train or portion of a parted train, in passing out of the block, will release the instrument while the block is still occupied; and precisely to the degree in which the signalmen may have fallen into the habit of depending upon the controlling devices, will there be danger of their giving a clear signal in such a case. Obviously, this condition would be common if permissive blocking were carried on. Of course, this weakness can be removed by the addition of track circuits taking in the whole length of each block so that, as in the case of automatic signals, a clear signal cannot be given so long as there is a single car in the block. But, on account of the considerable addition to the cost and the increased difficulty of maintenance, continuous track circuits have generally not been installed.

Merits of the system.—With continuous track circuits and all signals arranged to be automatically returned to the stop position the controlled manual should unquestionably be characterized as the ideal block system. It would be a combination of the telegraph and automatic systems, and each should check the faults of the other; a dangerous condition could hardly arise except through the coincidence of a failure of the controlling devices to prevent the clearing of a signal and, at the same time, an attempt on the part of one or both signalmen, through forgetfulness, to clear the signal improperly. Such a coincidence should be a very remote contingency.

The ideal condition is not usually attained, as one or both of the safeguards mentioned are commonly omitted. Even so, installation and maintenance are both costly. At the same time there is, in comparison with the telegraph block system, no such saving in cost of operation as an installation of automatic signals may effect. On the contrary, since the blocking should be absolute if the full advantage is to be derived from the controlled manual system, there must, in general, be a tendency to shorten the blocks and so increase the operating cost. While the controlled manual system is preferred by some railroad officers and the actual installations without all the possible safeguards, seem to have made excellent records, it appears that a much greater number of officials are fully satisfied with automatic signals.

THE ELECTRIC TRAIN STAFF.

A form of the controlled manual block system for controlling train movements on single track, known as the electric train staff system, is in use to some extent. Under this system each train passing through a block is required to carry from one end of the block to the other a small iron rod, called a train staff, as a visible evidence of its right to occupy that block; and no train is allowed to be in a block without having in its possession a staff for that block. Originally there was but one staff for each block, which bore the names of the stations at the ends of the block as the means of distinguishing it from the staffs belonging to the adjoining blocks. Evidently if, after one train had moved from A to B and left the staff at B, a second train moving in the same direction should arrive at A, the staff would be at the wrong end of the block, and the train could not proceed until a train in the opposite direction had returned the staff to A.

Operation.—The electric staff system meets the requirements of practical working by providing several staffs for each block, which are normally secured, part at one end of the block and part at the other, in electric staff instruments so arranged that it is impossible to have more than one staff out at a time. When all the staffs are in, A, with the co-operation of B to unlock his instrument, can remove one staff, and vice versa; but the removal of one staff so affects the electric circuit that neither instrument can again be unlocked until that staff has been placed in the instrument at the other end of the block or returned to the instrument from which it was removed. Thus the staff is the key to the block, the possession of which by a train prevents the admission of any other train at either end of the block.

To provide for permissive blocking, which is likely to be necessary where the blocks are long, a special staff is supplied. One of several removable portions of this staff can be delivered to each of several trains that have to pass through the block permissively; the last train of the series takes the staff with the unused parts, and this, when combined with the parts delivered by the preceding trains (and only when thus complete), can be inserted in the staff machine to make possible the removal of a staff for the movement of a train in the opposite direction.

The signal levers are usually provided with locks which can be released only by the use of the staff as a key. The signals may also have electric "slots" by which they are automatically returned to the stop position as trains pass.

INTERLOCKING.

The plan, Fig. 8, shows the arrangement of tracks at the junction of a double-track branch with a double-track main line, including a crossover to provide for movements from any track to any other and the signals required for complete signaling and interlocking at such a junction. Each switch is provided with a lock to secure it in its safe positions and detect, by failing to lock, any failure of the switch to move to a safe position.

To prevent the unlocking of a switch while a train is passing over it, each lock has connected to it a bar of flat iron supported along the side of the rail in such a way that it is raised above the top of the rail at each movement of the lock and checks the complete movement of the lock if such raising is prevented by contact with the wheels of a train.

The interlocking machine.—Each switch (or two switches forming a crossover), each lock (or two locks on adjacent switches), and each signal is operated by one of a group of levers assembled in the interlocking cabin or "tower." Nineteen levers are required for the plant illustrated and, allowing, as is customary, several unused spaces in the machine for additional levers that may be needed for fuutre extension of the plant, a machine of twenty-four levers is used. The levers are so mechanically interconnected that they can be moved only in a certain order and the movement of one lever will prevent the movement of certain others. Thus, distant signal lever No. 1 can be moved to clear its signal only when levers Nos. 2 and 5 have been moved to clear those signals, for which No. 1 is the distant signal; No. 3 can be moved only after the movement of Nos. 4 and 5. Signal No. 2 can be cleared only when switches Nos. 11 and 14 are set for the main track east and locked by No. 12, and while No. 2 is clear No. 12 cannot be moved to unlock the switches which, in turn, are thus prevented from being disturbed; switch lever No. 13 must also be in the position for the main track, so that no train moving in the opposite direction on the westward main track can be sent onto the branch track across the path of the train for which signal No. 2 has been cleared. Signal No. 4 cannot be cleared at the same time as No. 2, so as to allow a branch train to run into the side of the train on the main track, because No. 4 requires No. 11 in the reverse position—for the branch. The mechanism by which this interconnection of the levers is effected is called interlocking, because the movement of one lever locks certain others so that they cannot be moved.

Interlocking signals.—Signal No. 23 is the home signal for the main track westward, and distant signal No. 24 works in connection with it and signal No. 22. Signal arm No. 20, below No. 23, on the same post is the signal for a train passing from the westward main track to the branch and indicates by its position below No. 23 that the train is to diverge from the straight track and must reduce speed; distant signal-arm No. 21 gives the same information and works in connection with Nos. 20 and 19. The small signals, Nos. 6 and 7, govern movements eastward to any possible points from the westward main and branch tracks, respectively; No. 18 similarly governs westward movements from the eastward main track.

Signals Nos. 5, 19 and 22, called advance or advance block signals because, with reference to the movements of the trains governed by them, they are beyond or in advance of the interlocked switches and home signals, are the block signals at the entrances of the blocks extending from the junction to the next block stations in the three directions. Where automatic block signals are installed the advance signals are usually automatic and the distant signals are placed on the same posts with the automatic block signals next in the rear of the interlocking home signals (see Fig. 2). The interlocking home signals, Nos. 2, 4, 20 and 23, in addition to being operated by their levers, are controlled by track circuits extending from them to the next ("advance") automatic block signals, so that they return to the stop position when trains pass them and cannot be cleared while the controlling track circuits are occupied. Thus the automatic signal system is carried through the interlocking plants and trains are insured block-signal protection at every point.

Importance of interlocking.—It will be apparent that for the mere control of movements through the blocks from this point three signals would be sufficient; but it would be impossible to locate those three signals so as to govern and safeguard properly the movements at the junction itself. This can only be accomplished by the installation of a complete complement of signals and interlocking, which, as previously pointed out, is desirable at every railroad crossing, drawbridge, or important group of switches, and is hardly less important than the block signal protection between stations.

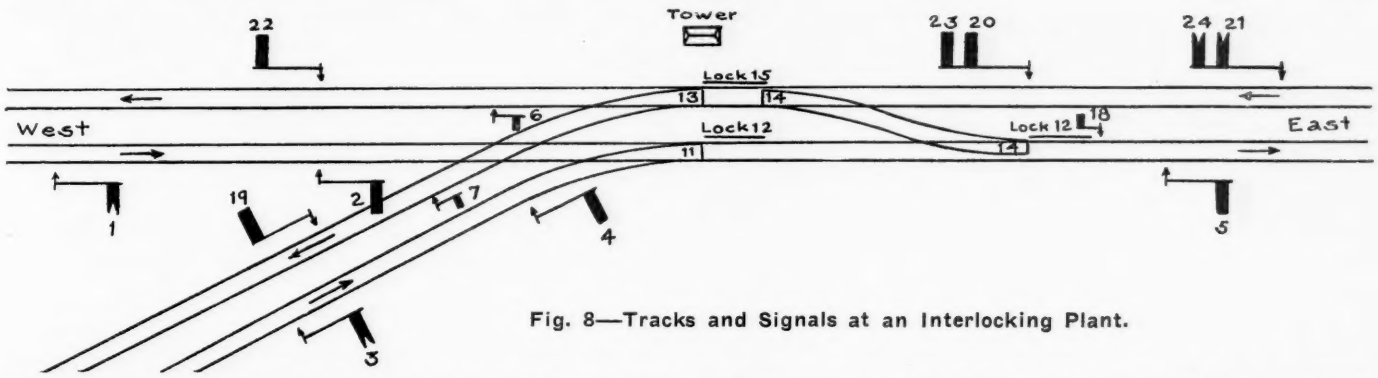


Fig. 8—Tracks and Signals at an Interlocking Plant.

From here the report goes on to describe the block signaling practice on the Chesapeake & Ohio. That road is selected as a road that has maintained block working on lines of both heavy and light traffic, double and single track, for many years with very satisfactory results, yet has not found it necessary to use elaborate or expensive appliances on the greater part of the line or to provide a much greater operating force than would be required for the station and train-order work if the block system were not in service. This road affords a good illustration of the possibility of securing satisfactory results from the use of the block system with a small expenditure of money. Signals having arms for movements in both directions on the same post are used to a great extent at simple block stations. On the busier double-track lines, however, there are interlocking plants at many of the passing sidings and other important points. Certain block sections on one of the single-track divisions, in which there are tunnels, are provided with a simple form of controlled manual block apparatus. On some of the double-track lines there are single-track tunnels. At these points there are interlockings for the switches at the double-track endings, and the short sections of single track are worked by the electric train staff system which is absolute; no provision is made for permissive movement of trains going in the same direction. * * *

The form of block register used at each station on the Chesapeake & Ohio has spaces for a very complete record of each operation connected with the movement of a train through the blocks on either side of that station. The several entries forming the record of one train are made in one column in the order of the train's movement. By noting, in the case of either block, whether or not all the spaces are filled in the last column containing entries, it can be seen at a glance whether the block is clear or occupied. If one train is passed at a station by another going in the same direction, its record for the block in advance is made in the next column beyond that for the train that passed it, so that the last column used correctly shows the condition of the block. In addition, a transfer book is provided in which the signalmen enter, with the signatures of both, the positions of the signals and the train orders on hand when one man is relieved by the other at the end of his time on duty.

Absolute blocking is maintained as far as possible, but on the busiest portions of the road, at some of the block stations, provision has been made for giving permissive signal indications; this is done chiefly in the case of freight trains ascending heavy grades. But on the lines of lighter traffic the exceptions to the absolute rule are said to be very few; and this is the case where the blocks are 8 to 10 miles long, and they are even longer on some branches having the lightest traffic. In some cases on single track there are passing sidings in these long blocks, and it is occasionally necessary to let two freight trains moving in opposite directions enter the block to meet and pass at such a siding. The trains are then, however, given telegraphic train orders providing for their meeting at that siding and, in addition, caution cards for their entrance into the block; so that the chances of the men on either train forgetting the meeting point are reduced to a minimum.

CERTAIN IMPROVEMENTS IN SIGNALING.

Among the improvements in signaling now in contemplation or in course of adoption special mention may be made, in conclusion, of the use of green lights instead of white for the proceed or "all clear" indication and semaphores giving their indications by positions of the arms above instead of below the horizontal.

The use of green lights for clear is now the practice on a number of important roads and is approved by many railroad officers and by the great majority of signal experts. The purpose of the improvement is, by taking a distinctive color for the clear indication, to eliminate the possibility that a stop or caution indication may be converted into "all clear" by the mere breaking of a colored glass, and at the same time to remove the recognized danger that one of the many lights in the streets and houses of cities and towns may be mistaken for the clear indication of a signal on which the light is out and which may at the time be giving a contrary indication.

The belief that the dangers are very remote, the expense of making the change and the difficulty of obtaining a good third color for the night caution indication have delayed this improvement. A glass giving a distinctive yellow-colored light has, however, been produced and one or two roads are using a green and a red light side by side. There can be little doubt that the other obstacles will give way before the growing conviction that the danger must be recognized and that the change ought to be made.

The semaphore arm working below the horizontal requires a counter-weight to bring it back to the horizontal position when the operating force is removed, and this must be sufficient to overbalance the weight of any possible accumulation of snow or ice on the arm. The desirability of having the arms work above the horizontal, so that their own weight and that of snow and ice would tend to bring them to the stop position, has ben recognized for many years. Unfortunately, before attention was given to these considerations, semaphores were made with arms working below the horizontal, and the first examples were copied as the semaphore type of signal grew in favor, until, when serious thought was given to the advantage of using the upper quadrant, the difficulty of making the change seemed too great.

To Messrs. Rudd and Rhea, of the Pennsylvania system east and west of Pittsburg, who have reported certain recommendations for uniform standard signaling on those lines, is perhaps due the credit of first seriously undertaking to bring about a change of practice in this respect. Signals exemplifying their recommendations are in trial service on one division of the Pennsylvania road; the arms are three-position; the arm 45 deg. above the horizontal indicates that the block immediately in advance of it is clear, but the next signal is in stop position; the vertical arm indicates that the block is clear and that the next signal also indicates block clear; that is, the next signal is either at 45 deg. or 90 deg. above the horizontal. Signals of this type are also on trial on one or two other lines and are authorized for a few joint terminal districts where the standard signaling of neither road concerned would be satisfactory to the other. Although they are warmly favored by many signal experts,

it is impossible to predict as yet whether these signals will ultimately displace those now in service.

British Practice in Railroad Accident Inquiries and Railroad Inspection.

BY LIEUT.-COL. H. A. YORKE, CHIEF INSPECTOR.

The Regulation of Railroads Act, 1842,* renders it obligatory upon every railroad company to give notice to the Board of Trade of its intention to open for passenger traffic any railroad or section of a railroad. This provision has no reference to lines used wholly for goods traffic. On receipt of such notice the Board of Trade is required to cause the line to be inspected before the opening takes place. If the officer appointed by the Board should after inspection report to the department that in his opinion "the opening of the line would be attended with danger to the public using the same, by reason of the incompleteness of the works or permanent way, or of the insufficiency of the establishment for working such railroad," the department may direct the company to postpone the opening of the line for one month at a time, the process being repeated from month to month as often as may be necessary. The company is liable to a fine of £20 a day if it should open a railroad in contravention of such order. The inspections made by the officers of the Board of Trade are very complete, the permanent way, bridges, viaducts, tunnels, stations and other works are carefully examined, iron and steel girders are tested, and the signalling and interlocking are thoroughly tried, and every means are employed to ascertain that the railroad has been constructed and completed in the most satisfactory manner. A simple code of requirements has been prepared by the department for the guidance of railroad companies, and as the special circumstances of each line are considered on their merits it does not often happen that it becomes necessary to postpone the opening of a new line. The Act does not authorize the department to inspect any railroad, or part of a railroad, after it has been opened, unless some alteration or addition is made to it, such as the construction of an additional line, deviation line, station, junction, or crossing on the level, in which case the new works are required to be inspected. It is the duty of the company to maintain the line in accordance with the standard of efficiency which it originally possessed, but whether it does so or not the Board of Trade has no power to interfere. It may be of interest to state here that all tramways or street railroads, or any extension of them, whether worked by horses, steam, cable, or electricity, have also to be inspected for the Board of Trade and "certified as fit for traffic" before they may be opened for public use.

The Regulation of Railroads Act of 1871 renders it obligatory on all railroad companies to give notice to the department of any accident which may occur in or about the railroad, or any works or buildings connected therewith, that is to say, any accident attended with loss of life or personal injury to any person whatsoever, any collision in which one of the trains is a passenger train, any passenger train or part of such train leaving the rails, or any other accident likely to have caused loss of life or personal injury, specified on that behalf by any order made from time to time by the Board of Trade. On receipt of such report the department is authorized to cause an inquiry to be made into the cause of any accident so reported, and the officer appointed to hold the inquiry has power to enter upon any railroad premises for the purpose of his inquiry, to summon any person engaged upon the railroad to attend the inquiry as a witness, and to require the production of all books and documents which he considers necessary for the purpose. There is no statutory procedure laid down for such inquiries, which are conducted in the manner that seems to the officer best suited to the circumstances of the case, but a fairly well recognized procedure has grown up. The site of the accident is first visited, and a careful investigation made of all the circumstances attending the disaster. An adjournment is then made to a room, and the evidence of the various witnesses is taken down verbatim. The court is not a court of law, and witnesses are not examined on oath, nor is the officer bound by the strict law of evidence; it is simply a court of inquiry. The admission of the general public and of the press rests within the discretion of the officer; the usual practice being to admit the press and public in cases of general interest, unless there has been loss of life, and there is any chance of any servant of the company, or of any other person, being put upon his trial for manslaughter or other grave offence, such as criminal negligence, in which case it is not as a rule considered advisable to admit the press, etc., lest the person implicated might be prejudiced by anything that transpired during the inquiry. It must be clearly borne in mind that the inquiry by the Board of Trade is for the purpose of ascertaining the cause of the accident with the view of preventing a recurrence of the same, and not for the purpose of penalizing anyone; the latter is left to be dealt with by the usual process of law. A Board of Trade inquiry, therefore, is in addition to, and independent of, any proceedings before the coroner or magistrate. The Act of 1871 confers upon the coroner, when holding an inquest on the death of a person occasioned by a railroad accident, the right to request the Board of Trade to appoint an inspector, or some person possessing special knowledge, to act as assessor to the coroner, and this is sometimes done. But such a course does not prevent the department from holding an independent inquiry. The same Act empowers the Board of Trade to hold what is called a "formal investigation" into the cause of any accident in lieu of, or in addition to, the less formal inquiry to which reference has been made. In the event of such "formal investigation" being held, the Board may appoint "any person or persons possessing special or legal knowledge to assist an inspector holding the inquiry, or may "direct the county court judge, stipendiary magistrate, metropolitan police magistrate, or other person" to hold the inquiry with the assistance of an inspector or any other assessor. Such an investigation has to be held in open court, and the witnesses may be examined on oath, and the court has all the powers of a court of summary jurisdiction, besides all the powers of an inspector under the Act. But the necessity for holding such a formal investigation has very rarely arisen. The inspector after making his inquiry is required to make to the Board of Trade a report as to the causes of the accident and the circumstances attending the same, with any observations on the subject which he deems right, and the Board "shall cause every such report to be made public in such manner as they think expedient." The usual manner of publishing such reports is to forward them to the railroad companies concerned, and to the press, and to anyone else who is interested. The reports are subsequently included in a "blue book" and presented to Parliament. It should be noted that although the officer may in his report make recommendations with a view to guarding against any similar accident occurring in the future, no power is given to the Board of Trade, or any other authority, to compel any railroad company to adopt such recommendations. This omission is sometimes criticized as a defect in the Act, but it is not really so. The moral effect of the publication of the report with the criticisms of the company's methods is great, and it seldom happens that a company refuses to adopt, or at least to test the recommendations made by the officer who held the inquiry. If, however, the company is of opinion that the suggestions of the officer are not likely to be useful, or are for any reason inexpedient, the company is at liberty to reject them, the responsibility of so doing resting on it. The effect of this latitude is to give the company discretion in the matter, and to enable the Act of Parliament to be administered without undue interference.

An important Act was passed in 1889, putting on the Board of Trade the duty of calling upon all railroad companies throughout the United Kingdom to adopt upon all lines carrying passengers the system of block working; to interlock points and signals, and to fit all trains carrying passengers with "continuous brakes." A reasonable time was allowed to the companies in which to comply, and the work is now practically complete. In respect of block working and interlocking, therefore, the lines of the United Kingdom are far ahead of those of any other country, and a marked diminution of accidents, particularly of collisions, has resulted from this cause. The use of the electric staff or electric tablet for single line working, which practically combines the principle of block working with the use of the ordinary train staff, is held to be a compliance with the Act. If, however, the ordinary train staff is used in conjunction with train "tickets," then block instruments have to be provided in addition. When the line is of such small importance that the traffic can be handled by one engine in steam, block instruments are, of course, not required. The effect of the regulations is that single lines as well as double lines in Great Britain are worked with a remarkable immunity from accident, and head-on collisions are almost unknown.

In addition to the Acts of Parliament safeguarding the interests of passengers, recent legislation has been directed to the protection of the servants of railroad companies, and investigations are held into numerous cases of injury, fatal or otherwise, which befall railroad men. A code of rules has been drawn up by direction of Parliament for the safety of the men, and further rules are at present under consideration.

There are four inspecting officers, whose duties are chiefly, though not entirely, confined to the inspection of new railroads and tramways, or new works on railroads, *e. g.*, signal boxes, stations, sidings, junctions, etc., and to the investigation of accidents to trains. There are also two assistant inspecting officers and three sub-inspectors, whose duties are chiefly directed to the investigation of accidents to railway servants. The above staff deals with all the railroads and tramways in the United Kingdom, including Scotland and Ireland. The duties are sufficiently onerous and responsible. The relations between the officers of the Board of Trade and the officers of the railroad companies are of a friendly nature, and the latter do all they can to assist the former in the performance of their duties.

*An earlier Act of 1840 contained similar, but less complete, provisions, and inspections of railroads prior to 1842, and inquiries into accidents prior to 1841, were held under the Act of 1840. The earliest recorded inspection took place in November, 1840, and the earliest recorded inquiry into a railroad accident was made in August, 1840.

Increasing the Earning Capacity of Freight Cars.*

The only restrictions to further enlargement in the number and capacity of locomotives and cars are the track and bridge gage, clearance and weight limitations, and the ability of industrial tracks and terminal facilities to receive the equipment. Ten years ago industrial works received their ore, pig iron, billets and similar materials in carload lots of 66,000 lbs., whereas with modern equipment this limit has been raised to 125,000 lbs.; the limit for coal has been increased from 60,000 lbs. to 110,000 lbs.; for coke from 40,000 lbs. to 70,000 lbs.; for cotton, grain and merchandise from 66,000 lbs. to 88,000 lbs., and for other items of carload freight the limits have been relatively increased. The bulk capacity of open cars has been enlarged from 800 to 2,000 cu. ft., and of box cars from 1,700 to 2,400 cu. ft. The length, width and height of cars have been extended in proportion, and the benefit to shippers and dealers in the way of increased tonnage per lineal foot of track space, reduced number of cars to handle and consequent decrease in switching charges and expense for loading and unloading freight is therefore quite apparent.

The general tendency has been to increase the weight of cars in somewhat greater proportion than the capacity, for the purpose of insuring sufficient strength in the equipment to favor the shipper by reducing the cost for loading and unloading freight and to enable the manufacturer or wholesaler to assemble a greater proportion of his output in one unit at the mill, factory or warehouse, thereby lessening the expense of handling and assembling this material at its destination.

In addition to the large number of freight cars placed in service, due consideration must be given to this increase in the comparative strength and carrying capacity. For instance: Assuming that there are 10,000 tons of coal to move from the mine region to a lake port for the lading of one boat, and likewise a quantity of ore to move from the same port to the furnaces, with a given number of cars assigned to such transportation service; ten years ago to have moved this coal would have required the use of 333 cars which could have returned with 11,000 tons of ore. To-day 182, or about 55 per cent. less, cars of modern design can transport the same amount of coal and return with 11,375 tons, or 3½ per cent. more ore, all of which has reduced the dock and mill yard, switching, loading and unloading facilities required by shippers and dealers. On the other hand, the railroads, in order to handle these larger capacity cars, have found it necessary to increase the strength of roadways and bridges, enlarge tunnels, elevate overhead structures and make relatively greater and more costly expenditures for track and equipment and for maintenance and operation.

Business has outgrown the storage, loading and unloading facilities for carload freight, and the railroads are expected to carry the burden of traffic congestion and of the extravagant use of cars for warehousing instead of for transportation purposes, whereas this expense should properly be borne by the producers, shippers, receivers and exporters. The matter of terminal facilities is the limitation of handling business during times of heavy traffic.

Design and Construction.

Compact train loads increase and accelerate movement by reducing the cost for switching and transporting traffic. Therefore, in the design of freight cars it is advisable to arrange for the maximum volume and weight of lading per lineal foot of track space and for the quick loading and unloading of the greatest variety of commodities.

While convertible features should not be embodied in equipment to an extent that would result in extraordinary first or maintenance cost, a limited number of practical arrangements, such as movable floors, ends and sides may be combined to provide a car suitable to carry and dump lading such as coal, ore, dolomite, sand and similar material into manufacturing plants, and to be loaded with billets, pig iron, pipe, plate, structural steel and other commodities, thereby enabling it to carry freight both coming and going, thus reducing the light car mileage to a minimum.

Wood should be used in freight car construction only where it is required to provide for the cleating and otherwise bracing and building up of certain classes of lading and where metal would not insure the proper insulation against heat or cold.

Of the various items contributing to freight car delays and failures, the couplers, coupler yokes, draft gear and their attachments to the underframes, body and truck bolsters and the wheels and brake equipment contribute either directly or indirectly to the greatest extent. A combination of coupler, coupler yoke and draft gear of sufficient strength and elasticity to withstand the locomotive maximum drawbar pull and the punishment due to buffing shocks will, when securely attached along the center line of draft to the center sills in such a manner as to distribute the stresses at the greatest number of points and over the largest area, materially reduce the coupling difficulties.

The use of substantial body and truck bolsters that will carry the ultimate load at the center plate; of anti-friction center plates and side bearings, and of ample lateral movement for couplers at the end sills will do much to reduce train resistance, wheel flange wear and liability for derailment. However, so long as the rail section now generally in use is continued it will be difficult to prevent rapid wheel flange wear and possibility for breakage.

Interchangeability of Parts.

While the Master Car Builders' Association has made much progress in promulgating general practices and adopting standards of minor parts of cars, the changed conditions now make it essential that car bodies and trucks as a whole, of similar kinds and classes, shall be simplified by standard practice and made interchangeable, and it is anticipated that some final action along these lines will result from the coming meeting.

Maintenance.

The number of loaded and empty system and foreign revenue freight cars (exclusive of cars in bad order condition under load at destination), held over each day (except after Sundays and legal holidays), for all classes of accident and ordinary repairs, should not exceed 3 per cent. of the total system and foreign revenue cars on the line and the repair force and material should be so regulated that no more bad order cars will be detained each day than the number repaired, every preference being given to loaded and empty cars that are in the greatest demand for the movement of the business offered. When the earning capacity averages from $2.50 to $3.00 per day for each freight car available for service, the interest on an investment for shop facilities to adequately economize and increase the output can be readily justified.

Indifferent foreign cars should be put in proper repair for loading and not returned to the owners light except when generally worn out by age and decay, or unless lading is not available and a home station is close by. This practice will avoid loss due to light mileage and additional damage to the car through its movement in a defective condition.

Terminal and Interchange Inspection.

The object of the Master Car Builders' Rules is to facilitate the movement of cars in interchange service and to place the responsibility for defects which may or may not make a loaded or empty car unfit for service. However, the intent of the rules is frequently nullified through a lack of good judgment owing to the somewhat general impression that the ability of a car inspector is decided by his record as a "car stopper" rather than as a "car mover," and the holding of cars by unintelligent inspection or on technicalities at joint and interchange points, is responsible for much delay to traffic, expense for transferring lading and loss of use of equipment.

Cars set off on the line of road due to bad order condition of couplers, draft attachments, wheels or brakes; heated bearings; shifted lading and other similar causes are usually the outcome of improper inspection, repairs, adjustment or testing of brakes, lubrication and loading at originating terminals, and result in accidents, destroyed lading and cars, reduced train rating, delays to traffic, blocking of passing sidings, engine and train crew overtime and extraordinary expense for sending men and material out on the line to make repairs. The elimination of rules and inspection points which are unnecessary to maintain cars en route in a serviceable condition for operation and safe for trainmen and lading; fewer and more thoroughly trained car inspectors; agreements between connecting lines that will keep cars moving on such interchange records as will insure proper accounting for repair charges; a greater number of more competent car repairmen and more thorough attention given to equipment at the unloading and loading points will, without a doubt, reduce some of the present line delays.

Loading and Unloading.

In general, shippers and dealers have been greatly benefited by cars of increased cubical and weight capacity per lineal foot of track space; by improved designs requiring the least expense for loading, building up of lading and unloading; by greater tonnage per car requiring less cars to be switched and by reduced terminal car mileage, while the railroads have not derived a proportionate increase in revenue to make up for the increased initial and operating cost, due to the sluggist movement of tonnage at terminals; reduced proportion of paying to dead load and an increased expense on account of rougher handling, and greater depreciation due to wear and tear.

During the transition from the light to the heavy capacity cars, the minimum weight limits for carload rate lading, which should be such as will insure full loading of the car, have remained stationary and this has made it difficult for railroads to demonstrate the advantages of the more modern service provided. The longer time taken for loading and unloading has also contributed materially to the inability of railroads to derive from their enlarged and improved trackage, terminal yard, motive power and operating facilities the movement of revenue freight that their investment has provided.

While cars are intended for the legitimate purpose of transportation, they do everything but spend the majority of their time in moving freight, and the existing situation should be remedied by restricting the free time allowance for loading and unloading carload freight to the real necessity of shippers and receivers who have pro-

*Extracts from a paper by J. E. Muhlfeld, Gen. Supt. Motive Power, B. & O., read at the March meeting of the Railway Club of Pittsburg.

vided adequate track and storage facilities to handle their business, and who do not require that the railroad terminal yards and equipment shall be incapacitated through their failure to handle lading on and off cars promptly.

Railroads should not be required to provide equipment to meet extraordinary transportation demands, when sluggish handling, for which they are not responsible, exists at terminals, but it is proper that they should apportion the car supply on the basis of the time required to load and unload, and to refuse to furnish cars at regular rates to those who have no handling or storage facilities and who make extravagant use of railroad company's equipment and tracks from which to handle business purchased by them in carload lots.

With the present earning capacity of freight cars the collection of the demurrage or rental charge in excess of the free time allowed, reimburses railroads to only a slight extent for the revenue that could be derived if the equipment was available for its legitimate purpose instead of serving time and increasing the expenses by a greater physical depreciation and interest on the investment than would be the case if it was employed in transportation.

The railroad demurrage rules and rates should be brought more nearly to a basis commensurate with warehouse storage charges, so that the value of their equipment, tracks and terminal space will have similar earning capacity. While legislation exists permitting railroads to impose demurrage charges for delays in unloading, there is none to compel the consignees to unload cars, although a decided reduction in the free time and other concessions allowed shippers whose business has outgrown their warehouses, elevator and other storage facilities would not be unreasonable.

A commercial or industrial organization would not think of allowing the equipment upon which it is dependent for its output to lie dormant for 21 hours during each 24-hour period, but this is the freight car situation of railroads which are to-day being criticised for the non-movement of important traffic. Under these conditions the consignors and consignees directly concerned are the only persons benefited, and instead of a shortage of car supply there exists a shortage of car movement.

To insure the prompt handling of the traffic of those consignors and consignees who have provided suitable and adequate facilities for forwarding, receiving and storing freight, it is but proper that such rules should be promulgated as will give them the same proportionate benefit of the improved railroad facilities that their own progress and investment justifies. This might be satisfactorily accomplished by increasing the present extremely low tariff rates and allowing a commutation on the total freight charges in lieu of a proportionate reduction in the maximum free time allowance for loading and unloading equipment after consignors or consignees have been notified that the cars are subject to their disposition. By this means a premium in addition to the established demurrage charges would be exacted from those dilatory shippers and dealers who do not cooperate with each other or with the railroads to reduce the idle time of cars, and the public would be materially benefited.

Distribution and Movement.

To accomplish better results in the distribution and movement of cars, a combination of greater lading and quicker handling is necessary, and some of the following rules may be worthy of consideration:

The distribution of the year's business and regulation of the movement of the general commodities required for living purposes to conform to the periods of greatest supply and demand and to the capacity of the railroads to handle the same, preferably during the season that gives the combined maximum speed and train load.

The distribution of cars as between shippers on the basis of their capacity for output and ability to promptly load and secure disposition of lading and release of equipment at destination.

A restricted supply of equipment to shippers and dealers who practice obsolete business methods and load and hold lading in cars subject to future market conditions.

The distribution of cars, as between railroads, on the basis of the number, cubical and carrying capacity of cars of the different classes owned; on the routing of the lading and on the mileage of the originating and non-originating traffic over the various lines.

Cars of such general condition that they cannot be depended upon to promptly pass inspection at interchange points should be restricted to owners' lines where company's material, local freight or other suitable lading can be hauled with the least liability of delay, transfer or repairs.

An increase in the carload minima commensurate to the enlargement in the equipment and the confining of classes and capacities of cars most suitable for local shipments to the territory where they will average the greatest amount of lading per carload lot.

The use of cars for such commodities as will permit of maximum lading, quick loading and unloading and non-interference with the use of the equipment for its designated purpose.

The non-use of railroad revenue service cars for the handling of mill refuse, garbage and like materials.

A public storage for bulk freight that cannot be promptly disposed of or trans-shipped at lake and tidewater ports; a reduced and uniform free time allowance for all commodities and an increased demurrage charge for cars placed on railroad and industrial tracks for loading and unloading.

The billing of lading in carload lots from origination to final destination and the discontinuance of costly stopover privileges for sampling, transferring or milling grain, dressing lumber, compressing cotton and like manipulation involving rebilling at intermediate points.

A curtailment of the reconsigning and readjusting privilege and an increase in the charge.

To stimulate the making of quick repairs, bad order cars to be no exception to per diem rules covering serviceable cars, except where unsafe to load on account of general worn out condition due to age or decay.

System cars consigned to company's use to be placed under car service charges.

A system of tracing for the location of delayed shipments in cars standing on siding, yard, repair and storage tracks, for the purpose of facilitating the movement.

The classification of trains to increase the main line movement of cars through or around the greatest possible number of intermediate terminals and to reduce the switching movement.

The non-holding of motive power for maximum train loads to be moved against the flow of traffic.

The prompt and regular movement of freight from loading to unloading points and advance information as to movement and arrival to be given the consignee.

The running of trains at regular intervals and with respect to the destination of cars rather than from one division terminal to another.

Reduced delays to trains at origination and destination terminals and en route, and the maintenance of a uniform schedule speed equivalent to at least 75 per cent. of the average running speed.

Locomotives suitable for the handling of trains of the greatest permissible tonnage at the maximum allowable speed over the different operating divisions should be used and loaded with a reasonable remaining surplus of power to prevent liability of trains failing to make schedule time.

Track Deformations and Their Prevention.*†

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VI.

EXPERIMENTS WITH THE DECLIMETRE.

The object of the experiments with the *déclimètre* was to measure the bending of the tie and to bring about the overturning of the fastenings under increasing forces, having as an effect the spreading of the track to the limit (.98 in.), where it is considered as out of service.

This apparatus is essentially composed of a screw and nut, and rests on the heads of the two rails, under conditions similar to those of the wheel tires. The screw acts, through the intermediary of a ball and piston, on glycerine, which is contained in a reservoir, the pressure of which is registered by a pressure gage; it tends to spread the two rails, and the force causes the tie to assume a convex curvature. (See Fig. 14.) The displacement of the rail is registered and amplified by an independent instrument.

This apparatus serves also to measure the resistance of the track to lateral displacement, by supporting it against an abutment pier, and by acting on a single rail.

The experiments were made on composite and wood ties, at first in separate units, then by groups of two, each distant from the other (13.78 in.). The ties were placed on two supports, nearly of the length corresponding to that of the tamped bed. Steel ties in use on the state system were also experimented with, under similar conditions.

The apparatus was fixed, in the first case, in the axis of the tie to be tried, and in the second case, in the center of the two ties. In order to measure the curvature of the pieces, which it tended to produce, and which made known, so to speak, the degree of their rigidity, there was opportunity for estimating the importance of the flexures from their initial position which these pieces underwent. To this effect a right line was traced on the ties, whose two extreme points were placed near the ends of each of the pieces, and, at a given moment, the flexure in comparison with this line, now become curved, was measured, by describing with the same points a new right line, and by observing the departure of these two lines at the middle of their length.

This apparatus, which tended to spread the two sections of rail, acted at first on the tie, to induce its flexure; then, when this had attained a certain degree, which corresponded to the bending

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†Authorized translation by W. C. Cushing, M.A., B.S., Chief Engineer of Maintenance of Way, Pennsylvania Lines West, Southwest System.

of the head of the screw spike on the plate, apart from its shoulder, the fastenings, principally those placed in the interior, commenced to be overturned, up to the moment when the base of rail escaped from the head of either of the interior screw spikes. (Fig. 15.) This effect was obtained without increase of force.

These experiments have shown that there was reason for consolidating the interior fastenings, and for increasing the number in comparison with the exterior fastenings. The good effect of the reinforcement of the plates in use on the P. L. M. system was also proved. In the type employed, the head of the screw is only partially sustained by the shoulder; it has then a tendency to overturn in the empty space until it meets the exterior part lying below the shoulder. There results a weakening of the fastening and a bedding of the screw spike which diminishes the resistance to this kind of force. The rail is no longer maintained by the screw spike, and generally escapes from the fastening. In order to remedy this disadvantage, it is sufficient to prolong the shoulder of the plate on the exterior. In the trials which followed, the interior screw spike took the position indicated in Fig. 15, and the resistance to overturning was increased by 20 per cent.

The experiments with the *déclimètre* were carried on in like manner with the steel ties of the State System. The rails were fixed on the ties through the intermediary of steel plates, with an inclination of 1 in 20, and bolted on their upper surface. Three bolts per rail were used in the first test, two on the exterior and one in the interior; in the second, two in the interior and one on the exterior. The *déclimètre* was placed, as in the preceding experiments, in the axis of the tie. The forces were successively exercised, and were noted for each spread of the rails of .2 in. up to .98 in., where the track is considered out of service. The deformations of the beam, placed on two supports right at the rails, were read in comparison with the lower and horizontal edge of a steel rule, resting on invariable supports parallel with the tie. The latter was raised at the center in comparison with its original position, and lowered at its extremities; the curve of deformation was thus convex upward.

It would take too long and be without great interest to give the detail of all these experiments. They are summarized in the table hereafter:

SUMMARY OF MAXIMUM RESULTS OBTAINED.

Designation of Experiments made.	Plates employed.	Composite ties. Forces.	Spreading.	Flexures.	Oak ties. Forces.	Spreading.	Flexures.	Steel ties of the State. Forces.	Spreading.	Flexures.
		One screw spike in the interior.						A bolt in the interior.		
Single ties.	Ordinary	7,899 lbs.	0.75 in.	0.18 in.	7,877 lbs.	0.95 in.	0.41 in.	8,267 lbs.	0.83 in.	0.47 in.
		Two screw spikes in the interior.						Two bolts in the interior.		
		16,314 "	0.18 in.	0.28 in.	16,259 lbs.	1.08 "	0.82 "	18,298 lbs.	0.98 in.	0.91 in.
	Reinforced	One screw spike in the interior.								
		8,303 "	0.77 in.	0.17 in.	9,204 lbs.	1.02 "	0.51 "	.....	.....	.....
		Two screw spikes in the interior.								
		16,755 "	1.17 in.	0.43 in.	18,930 lbs.	1.31 "	0.81 "	.....	.....	.....
Twin ties.	Ordinary	One screw spike in the interior.								
		*18,960 "	0.98 in.	0.28 in.	17,086 lbs.	0.98 "	0.36 "	.....	.....	.....
		Two screw spikes in the interior.								
		*33,620 "	1.18 in.	0.46 in.	32,518 lbs.	1.18 "	1.01 "	.....	.....	.....
	Reinforced	One screw spike in the interior.								
		17,968 "	0.89 in.	0.32 in.	19,841 lbs.	0.98 "	0.46 "	.....	.....	.....
		Two screw spikes in the interior.								
		35,677 "	1.30 in.	0.51 in.	39,683 lbs.	1.38 "	0.89 "	.....	*.....	.....

*This experiment was not continued since the maximum force was not reached.

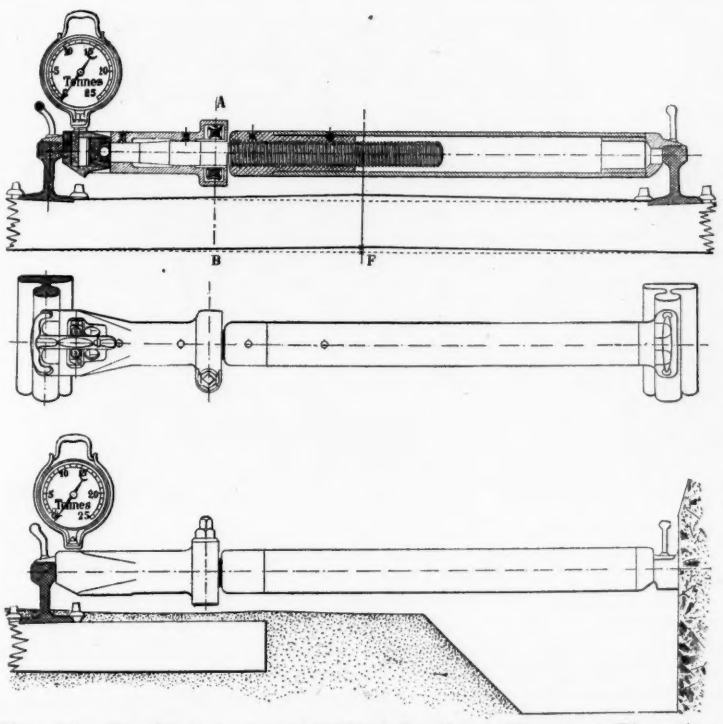
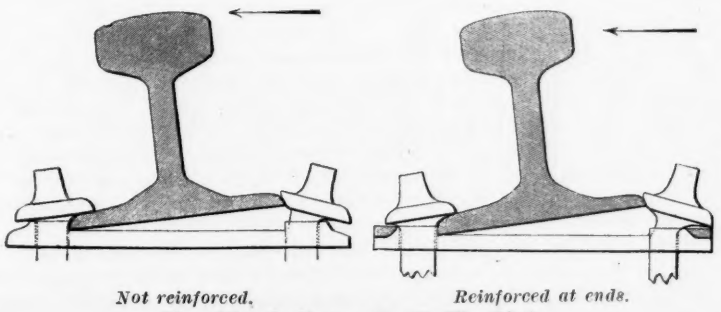


Fig. 14—Declimetre; Longitudinal Section, Plan and Elevation.



Not reinforced. *Reinforced at ends.*

Fig. 15—Ordinary P. M. Tie Plate.

This table shows: (1) that the forces were proportional to the number of interior fastenings; (2) that the forces sustained by the composite ties, provided with ordinary plates, were a little superior to those undergone by the wood ties, but that the inverse result was obtained in the experiments with reinforced plates. This fact can only be explained by the more complete reinforcement of the shoulder of the plates employed on the wood ties. In fact, for these latter pieces, the shoulder was prolonged in an inclined plane, C D, by adding a piece A B C D (Fig. 16), while we were satisfied, for the plates intended for composite ties, with a plane G H (Fig. 16), much less inclined; thus the heads of the screw spikes were found to be more supported on the first plates (Fig. 18), than on the second (Fig. 16), which explains the difference in the increase of the forces.

It may therefore be concluded that with plates absolutely identical, the forces would have increased in the two cases in the same proportion. Whatever it may be, no track is submitted in practice to the forces which were obtained, and these latter can always be considered as maxima, which will never be reached.

DEFORMATION OF TIES.

The curves of deformation of these different ties, a deformation which was obtained by spreading the track, acting horizontally on the rails, are those which give the application of the theory, and the theoretical flexures are very close to those which were observed.

The moment of the flexure to which the wood and steel cross

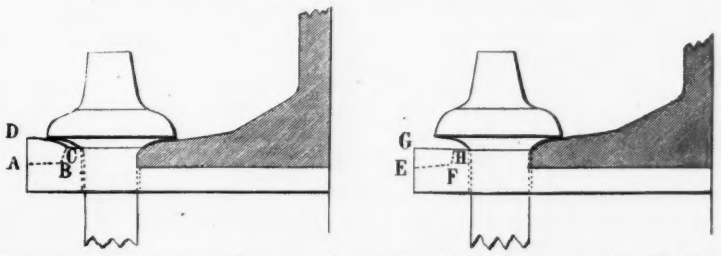


Fig. 16—Tie Plates Used on Wood (Left) and Composite (Right) Ties.

ties are submitted is constant for all sections; the curve of deformation, determined by the condition that the beam, resting on two supports right at the rails, is horizontal at the middle of the span, is then represented by the equation:

$$E\,I\,y = \frac{K \times 2}{2} - \frac{K\,(1a)}{2},$$

in which K represents the moment of constant flexure, l the half span of the beam, a the length between the extremity of the beam and the rails, by taking as the origin of co-ordinates the middle of the beam, and as axes the neutral line and the perpendicular erected at its middle.

It has been deduced from it that the total bending of the beam, which is equal to the sum of the flexures, at the middle and at its extremities, is given by the expression:

$$\frac{K\,1\,2}{2\,E\,1}$$

The table following permits a comparison of the observed and

theoretical flexures, calculated as has just been described; the flexures obtained have been taken by attaching the rails to the cross ties with the screw spikes in the interior, which assures the greatest solidity to the fastening, and an integral transmission of the force to the beam:

Value of the force.	Bending moment of tie		Flexures			
			Wooden ties		Steel ties	
	Wooden.	Steel.	Observed.	Theoretical.	Observed.	Theoretical.
2,205 lbs.	180	.....	.....	.....	.....	.....
4,409 "	360	.....	0.40 in.	0.24 in.	.....	.....
5,291 "	432	323	.....	.....	0.26 in.	0.29 in.
8,818 "	720	.....	0.64 in.	0.47 in.	.....	.....
9,920 "	810	605	.....	.....	0.44 in.	0.55 in.
11,023 "	900	.....	0.80 in.	0.59 in.	.....	.....
13,228 "	1.080	.....	0.78 in.	0.71 in.	.....	.....
13,669 "	1.116	834	.....	.....	0.59 in.	0.76 in.
15,432 "	1.260	.....	0.75 in.	0.83 in.	.....	.....
16,259 "	1.328	.....	0.82 in.	0.88 in.	.....	.....
16,314 "	1.332	995	.....	.....	0.69 in.	0.91 in.
18,298 "	1.494	1.116	.....	.....	0.91 in.	1.03 in.

Two observations may be made on the results set down in this table:

1. The theoretical flexures of the wood tie are sensibly equal to the flexures observed within the limits of elasticity of the wood, that is to say, in the case in question, up to a force of 11,023 lbs., corresponding to a bending of .79 in. When this bending is reached, it is remarked that, under increasing forces, the bending diminishes, which corresponds to a new state of the body, which takes a permanent deformation, and is extended while taking a less curvature. Besides, from this moment, the wood becomes brittle, and several ties were broken under the plate, where the weakest section is found by reason of the adzing for the plate.

2. The theoretical flexures of the steel tie are a little superior to those which were observed. The reason for it is the following: The plates of support for the rail were riveted to the upper surface of the cross tie and became a part of it. An increase of section results, for a notable length of the beam (about 23.62 in.), and, consequently, of the moment of inertia; the latter, which in the normal section is only 168, is increased by the moment of the plate, that is to say 256, a value which reaches nearly double the inertia of the section of the ties.

The latter has, then, from this fact, an exceptional rigidity, which explains the difference observed between the theoretical and recorded flexures.

STRESS OF METAL AND OF WOOD.

It is possible, after having studied the deformation of cross ties, to investigate the stress of metal and wood resulting from this deformation. It is given by the formula:

$$R = \frac{x\ z}{I},$$

in which R is the stress per unit of surface, x the bending moment, $\frac{I}{Z}$ the resisting moment of the beam.

The table which follows gives for each force the maximum stress to which the extreme fiber of the sections is submitted.

Value of force.	Moment				Value of force, in lbs. per sq.in.	
	Bending		Resisting			
	Wood tie.	Steel tie.	Wood tie.	Steel tie.	Wood tie.	Steel tie.
2,205 lbs.	180	135	18	30	355	6,400
4,409 "	360	270	..	..	711	12,800
5,291 "	432	323	..	..	853	15,645
8,818 "	720	540	..	..	1,422	.....
9,920 "	820	605	..	..	.....	28,589
11,023 "	900	675	..	..	1,778	.....
13,228 "	1.080	810	..	..	2,133	.....
13,669 "	1.116	833	..	..	.....	39,498
15,432 "	1.260	945	..	..	2,489	.....
16,259 "	1.328	992	..	..	2,617	.....
16,314 "	1.332	995	..	..	.....	47,164
18,298 "	1.494	1.116	..	..	.....	52,910

It is observed: 1. That the wood tie was stressed, in the experiments accomplished, very near to the limit of elasticity of the material which composes it, since the latter is nearly 2,133 lbs. per sq. in., as was established in the study of the deformation. The result to be drawn is that a wood cross tie ought never to take a flexure greater than 0.40 in. under penalty of being exposed to rupture.

2. That the steel tie was stressed to a limit near that of rupture, 52,626 lbs., in place of 64,004 lbs. per sq. in., and that it has a resisting moment little higher, since, under a feeble force its stress reaches the limit generally admitted, 6,400 lbs. per sq. in.; it is true that the plate or the chair can reduce in a large measure the calculated stress.

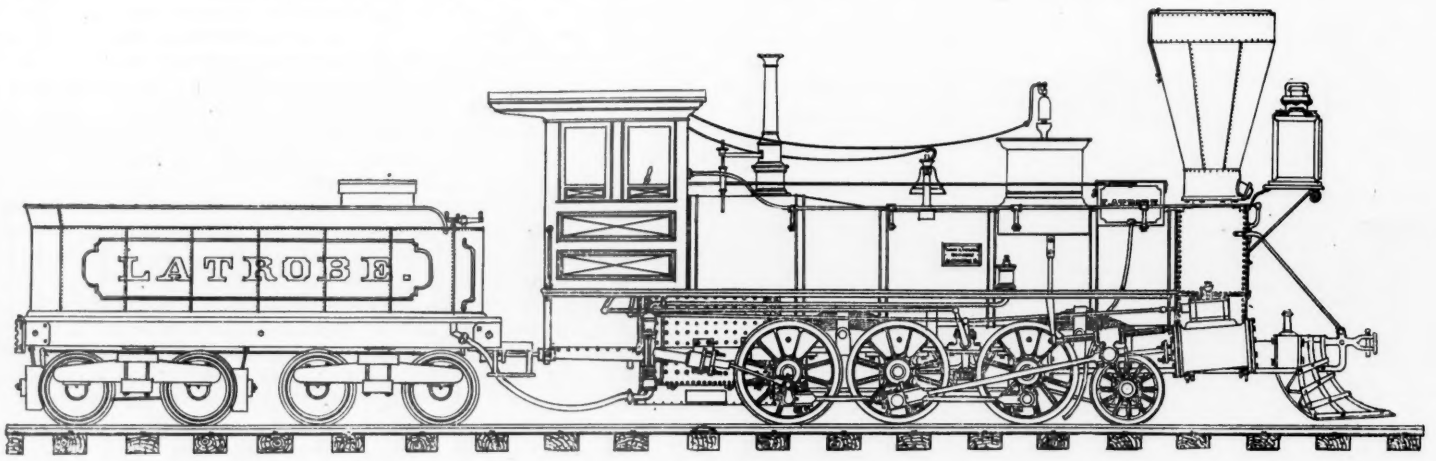
(To be continued.)

Smith & Perkins, and Their Locomotives.

BY C. H. CARUTHERS.

Few of the younger railroad men of to-day are probably aware that locomotives were once built in Alexandria, Va., but those who were actively engaged on railroads in the years immediately preceding, and during the ten or twelve following the Civil War, and who are still living, know that from 1851 until 1858 the Virginia Locomotive Works, conducted by Smith & Perkins, was located at that place and turned out during that time a number of locomotives which proved very satisfactory to the companies for which they were built. Perhaps the greater proportion of the output was sold to roads centering in or near Alexandria, although two were built of the Hayes 10-wheel Camel type for the Baltimore & Ohio, two for the Allegheny Portage Railroad, of the state system of Pennsylvania, and fifteen for the Pennsylvania Railroad. One of those first referred to was of 4-4-0 type named "Virginia," and is said to have had a good reputation for speed.

Nearly all differed in many respects from other locomotives

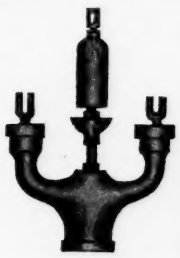


The Latrobe, P. R. R. No. 41.
Built by Smith & Perkins, Alexandria, Va., 1852.

then in service, and although some of these differences in construction were not found to be altogether desirable, the engines had many points of merit, and were built of good material and of excellent workmanship. All were fine steamers and very quick. The quality of materials used in their construction was fully shown when an attempt was made to explode the boiler of one after it had been put out of service at the end of fifteen years from the date of its construction. This trial was made at a point near the Horseshoe Bend, used by the Pennsylvania railroad company for such experiments, and although every conceivable condition was tried under which a locomotive boiler was likely to explode, all were unsuccessful.

The line-drawing of engine "Latrobe" (later No. 41) shows the exact appearance of the first two Smith & Perkins' locomotives built for the Pennsylvania Railroad, and the two built for the Allegheny Portage Railroad, at the time of coming on their respective roads in 1852. The design was exactly alike in all four, although the two Portage engines were considerably heavier than the other two. It will be noticed that the boilers were of wagon-top type with a column containing the safety-valves located near the front of the roof-sheet. This column was surmounted by a neat escape pipe of polished brass. The dome was well forward on the barrel of the boiler, and the whistle was on the center of its cover.

The cylinders were slightly inclined, without castings of any kind, and were bolted to the frames and sides of the smokebox. Single guides of diamond-bar pattern were used, and but one valve was in each steam-chest. This valve, however, like those on the Winans Camels, could be worked either at full or half stroke by the type of drop-hook gear used, which was illustrated in the *Railroad Gazette* of Aug. 17, 1906, page 142. Each engine was carried on three pairs of driving wheels and one pair of leading wheels, all placed between the cylinders and firebox, and with the axle-boxes of the leading wheels held in rigid pedestals on the main frames,



"Buckhorns."

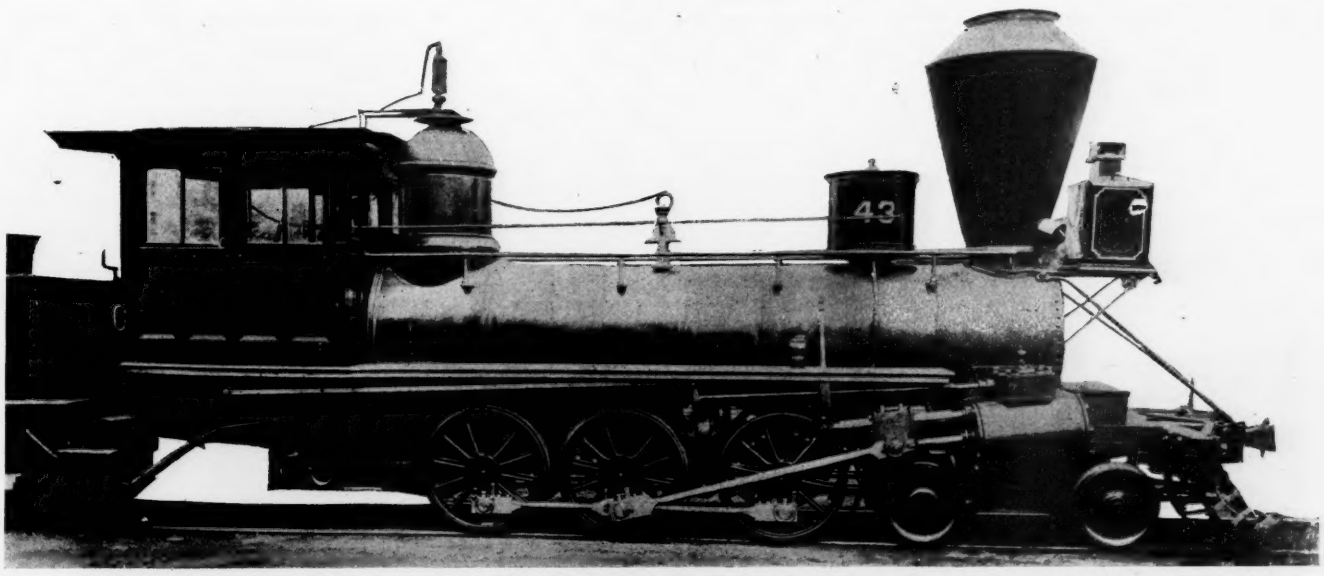
Odd Dome Casing.

exactly like those of the drivers. It has never been clear to the writer what the builders expected to gain by using this smaller pair of wheels arranged rigidly, instead of another pair of drivers, which would have given the advantage of 12,400 lbs. additional weight for adhesion, and the engines would doubtless have rounded curves as well. With the arrangement used, no flanges were on either the first or second pairs of drivers. Two pumps were used on each engine and were placed, one on each side, behind the rear pair of drivers, from the pins of which they were driven by return cranks. The smoke-arches were square at the bottom and quite deep. The cabs were well lighted, and had two panels on each side sloping uniformly at the ends and sides from a raised point in the center of each. The sandboxes were square with polished brass trimmings around the edges, and the name of the engine was in letters of the same material placed in the center of each side of the boxes. Bands of polished brass also encircled the Russia iron jackets of the boilers. The dome-casings were of plain sheet iron painted, with mouldings at top and bottom of cast iron. The painting consisted of vermilion on the wheels and the mouldings of the dome-casings, and green on the plain parts of the sandboxes and dome-casings, and the cabs.

After several years' service, "buckhorn" stands for the safety-valves with the whistle between the branches, were placed on the columns on the roof-sheets of three.

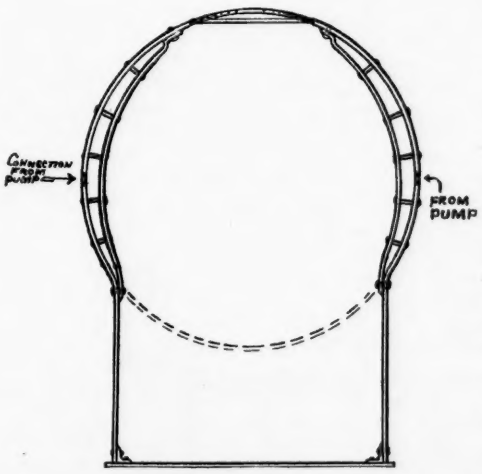
The two Portage engines, of course, came into possession of the Pennsylvania when that company bought the state improvements in 1857.

From the half-tone of No. 43, reproduced from a photograph taken of that engine, which was another of the four, soon after it had received a new firebox and other repairs at the Pittsburg shops in 1863, it will be seen that the dome has been taken off the forward part of the boiler barrel and placed on the roof-sheet, with the safety-valves on the cover, and a large cylindrical sand-box of a type used extensively by the Pennsylvania for a time on freight engines, has been substituted for a square one like that shown on "Latrobe." A four-wheel vibrating truck has also replaced the single pair of leading wheels, and one non-lifting injector replaced the two pumps. The drop-hook valve motion is retained, but without the cut-off hooks and straps, although the cut-off eccentrics, which were cast solid, were not removed from the axle, nor the "half-moons" for its control from the auxiliary reversing shaft. This engine had been originally built with an excess of overhang at the rear, and showed a dangerous tendency to lift the front end from the rails when running. It was, therefore, relegated to yard service at Pittsburg, and even then ran with a considerable weight of scrap iron piled in a box on the short space between the smokebox and the bumper. It was thought that the introduction of the four-wheel truck in 1863 would remedy this trouble, but one or two trips over the division soon dispelled this illusion and the engine spent the next twelve years in further yard service, and was then cut up. The stack shown on it was an adaptation of John P. Laird's patent to the ordinary freight stack of the period.



P. R. R. No. 43 (Altoona).

Built in 1852 at Alexandria, Va., by Smith & Perkins. The only changes from the original form are cab, smokestack, four-wheel truck, sandbox, dome-case and removal of dome from waist to roof-sheet. A column containing the safety valves at first occupied the roofsheet. These valves are now shown on the dome cover. The four-wheel truck replaces the original single pair of 30-in. leading wheels carried in rigid pedestals. The injector shown replaces a pump which stood in about the same place and was driven by a return crank on the pin of the rear driver. Such an arrangement also existed on the left side. No. 43 was scrapped in 1876.

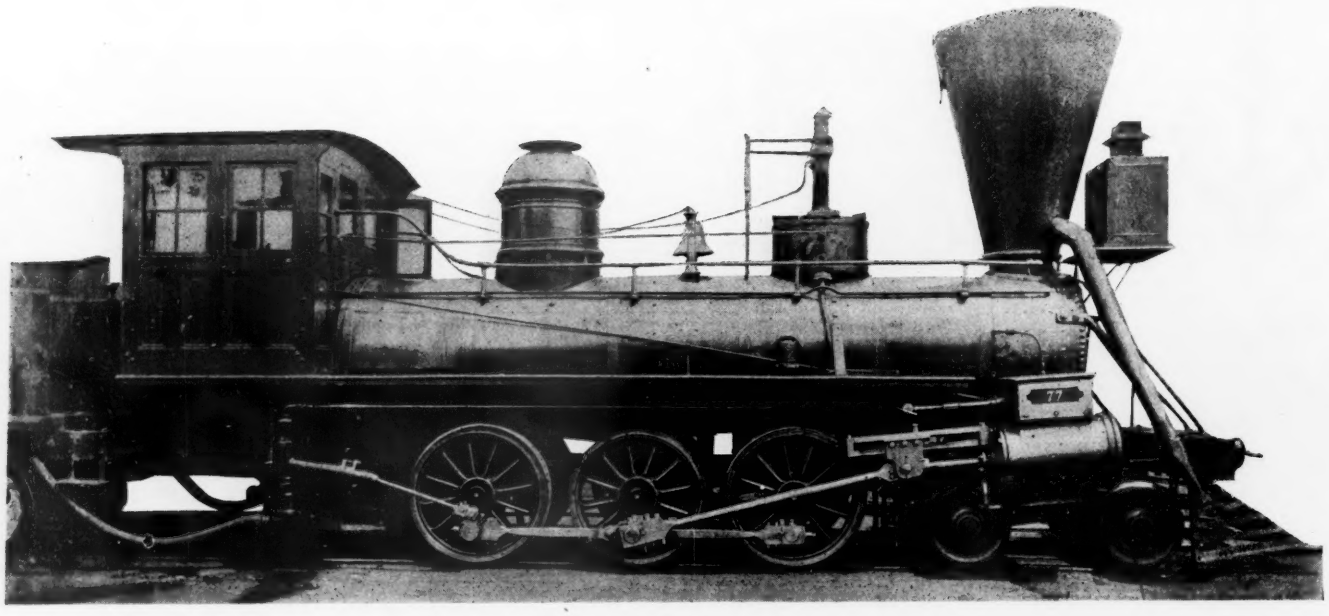


Water Spaces in Smokebox.
Smith & Perkins, 1853.

The next ten built for the Pennsylvania came on the road at various times in 1853-4. They were somewhat heavier than the "Latrobe" and differed from it somewhat in design.

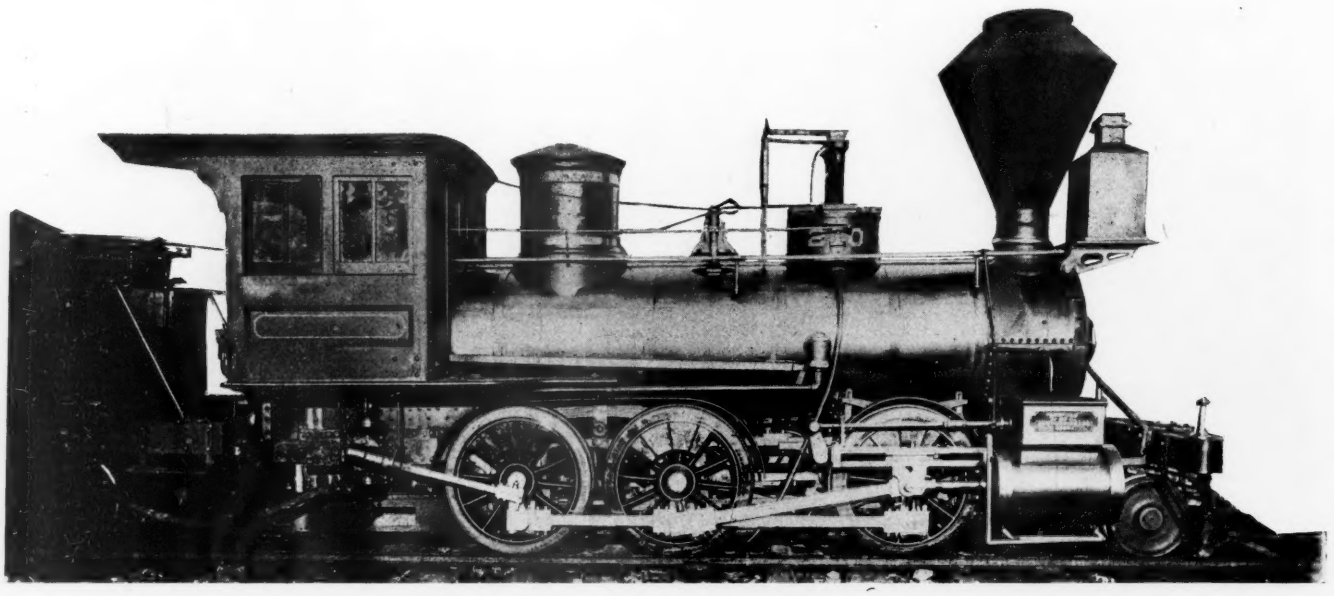
These engines had straight-top boilers with copper fireboxes, domes well forward on the roof-sheets and fitted with close covers. The safety-valves were on the tips of a "buckhorn" casting with the whistle placed between, and this casting was attached to the top of a column about twelve inches in height which was fastened to the top of the first wing of the boiler-barrel. The sandboxes were circular with flat tops and bottoms, and the safety-valve columns mentioned passed up through their centers. Pumps, valve-gear, cylinders, guides, hand-rails, bells, wheels, rods, stacks and cowcatchers were identical with similar parts on "Latrobe," but one striking difference was in the smoke-arches which were made with water-spaces on each side opening into the boilers and connected to the check-chambers by branch pipes, as shown on half-tone of engine "Goliah." The sheets forming these water-spaces were strengthened by staybolts as in the water legs of a firebox. The arrangement proved troublesome, and the inner plates with the connecting branch pipes were taken out, and the tube sheets closed in the usual manner. Circular plates covered the feed openings in the outer sheets, and the heads of the staybolts remained as a reminder of the device.

The boiler casings were of Russia iron with bands of the same material. The dome casings were also of Russia iron, with moulded bases and cornices of cast iron. Two narrow bands of brass encircled the Russia iron at top and bottom, and the name of the engine was on the base formed of polished brass letters, except in the case of the first one of the lot. Here the casing was entirely



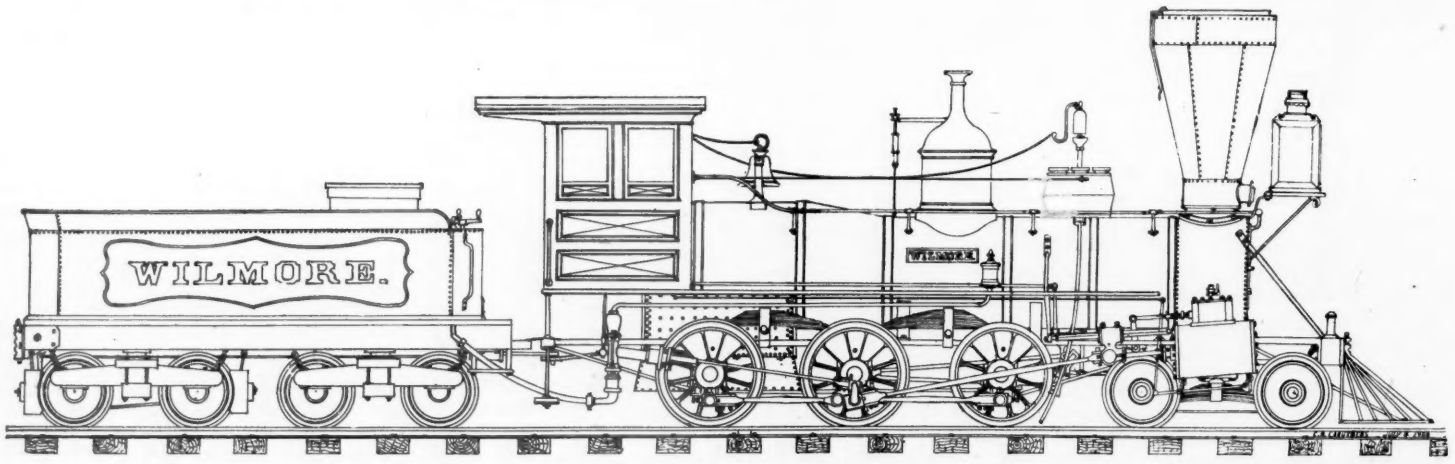
The Johnstown. Pennsylvania Railroad No. 77.

Built in 1853, *at Alexandria, Va., by Smith & Perkins. The only parts not of original engine are cab, dome-casing, four-wheel truck and link motion. The last two parts were substituted for original drop hooks, and single pair of* 30-*in. leading wheels set in rigid pedestals at Altoona shops in* 1865. *Heads of staybolts for water space which at first surrounded sides of smoke-arch, and also the plate covering opening where auxiliary feed-water entered while the water space was used, show plainly on the photograph. A pump similar to the one shown is on the other side of the engine. No.* 77 *was cut up in* 1875.



Pennsylvania Railroad No. 210, as Rebuilt at Altoona, 1865, by J. P. Laird.

Built by Smith & Perkins at Alexandria, Va., in 1853. *It is probably Philadelphia, No.* 63, *although a similar engine named Wilkinsburg, No.* 93, *had been sent with the* 63 *to the P. & E. Division in* 1864, *and their numbers changed. One was later returned to the main line and numbered* 210, *and rebuilt as shown. It is somewhat difficult to discover accurately which of the two this was, but indications point to* 63 *rather than* 93. *The boiler, dome, sandbox, buckhorn, safety valves, bell, are original. Everything else is new. If it was old* 63, *even the dome-casting is not quite like the original, as that engine came out with one different from all the other Perkins engines, but after about one year's service received one like that shown, which was the type used on all the other Perkins engines. This engine subsequently had the safety valves placed on the dome cover, and received a standard sandbox. It fell into the cellar of the paint shop when the shops were burned during the riots at Pittsburg in* 1877, *and the intense heat of the burning oils, etc., so badly damaged it that it was cut up.*



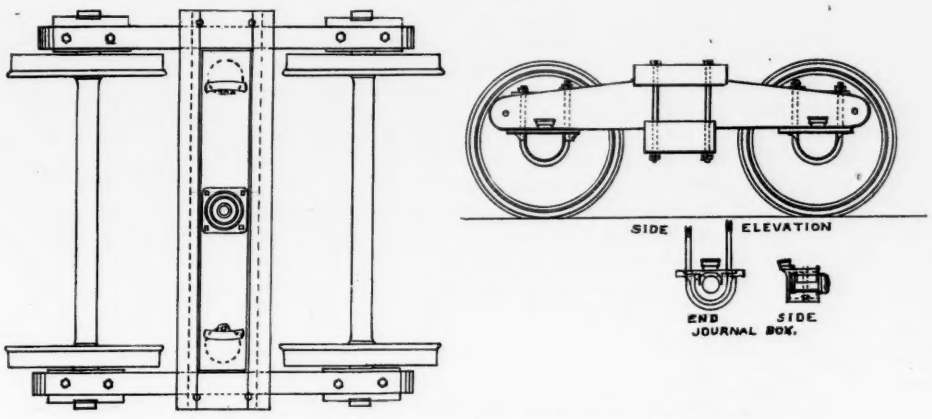
The Wilmore, P. R. R. No. 127.

1856. *Cylinders,* 17*x*22 *in.; drivers,* 44 *in.; Gooch valve motion, suspended link. Weight on drivers,* 44,000 *lbs. Total weight,* 60,000 *lbs. Boiler,* 42-*in. diameter. Firebox,* 60 *in. long, inside. Fuel, coal.*

of Russia iron without mouldings, and the letters forming the name were placed midway between the top and bottom. This casing was afterward replaced by one of same design as on the other engines.

The edges of the top and bottom of each sandbox were polished, as also were the cylinder heads, rods, the greater part of the valve gear and connections and the steam chest covers. The steam chests were polished at the top and bottom, with a rough strip left at the center about one-third of the height of the chest. This strip was painted black. The wheels, cabs, sandboxes and mouldings of the dome-casings were painted vermilion.

Although the photograph from which the half-tone of No. 77 (Johnstown) was taken, shows that engine after it had received some changes at Altoona shops in 1867, it will convey a good idea



Smith & Perkins Tender Truck, 1852-1859.

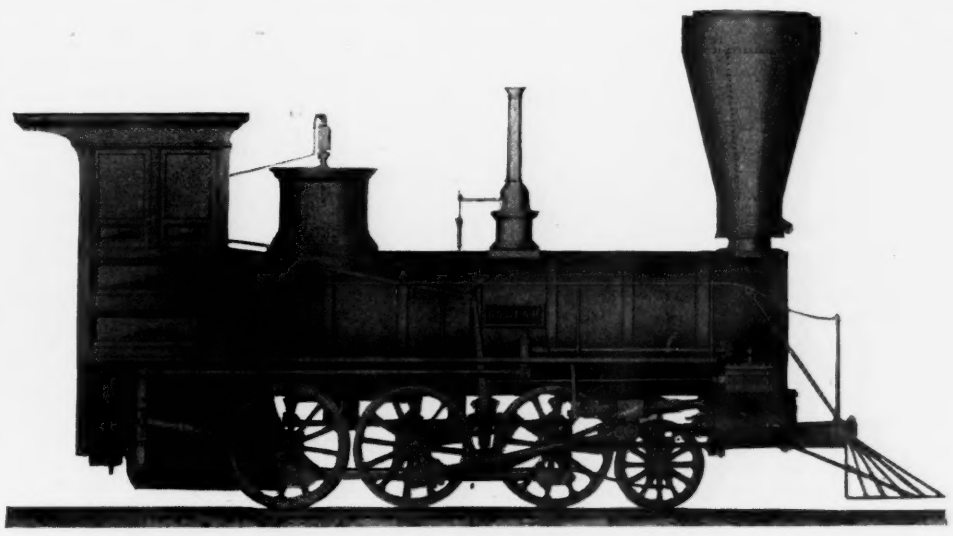
of the general appearance of the lot of ten engines of which it formed one; as the original sandbox, "buckhorn" stand with whistle and safety valves, bell and fixtures, hand rails, driving-wheels, main and parallel rods, pumps and connections, frames, boiler and smokebox still remain. The heads of the staybolts used in connection with the water-space in the smokebox and the circular plate covering the former opening for the auxiliary branch pipe, can be seen plainly. The changes referred to are, the substitution of link-motion for drop-hooks, the four-wheel truck for the single pair of leading wheels, Laird guides and crossheads for the single diamond-bar guide, a dome-casing adapted to the new condition of a pop-valve in the cover, and casings over the cylinder and steam-chest. The stack and cab are of types applied to all of the Perkins engines on the Pennsylvania within two or three years after they came on the road. It is unfortunate that the artist did not include more of the tender and thus show at least one of the original trucks which remained under it. Just the end of one of the outside wooden stringers appears. The forward engine spring has also been moved back, and rests with one end beside the front end of the rear spring on the central driving-box, the buckle on both having been moved sufficiently to equalize the weight.

Engine No. 210 shows a Smith & Perkins boiler used with entirely new cylinders, frames and running gears, the latter of Mogul type. This combination was made at Altoona in 1865 after one or two of these engines had been transferred to the Philadelphia & Erie, numbered in conformity to the numbers used on that road at the time, but had been returned to the Main Line after about one year's service. It was then renumbered 210, as shown. The boiler, sandbox, "buckhorn" stand with safety-valves and whistle, bell and fixtures, dome and casing, and handrails from the dome forward are the original. The records of the company show that 63 and 93 were the two sent to the Philadelphia & Erie, but do not state which was afterward changed to 210. About 1873 the safety-valves were placed on the dome cover and the sandbox was replaced by one of standard type, the "buckhorns" and their column passing to the scrap-heap. The engine was then used on Liberty street in Pittsburg until July, 1877, when it was cut up as the result of a terrific burning received after falling with a quantity of oil and varnish into the cellar of the paint shop at the time of its destruction by fire during the riots of that year.

One of the greatest objections to these engines was the amount of overhang at each end. This not only caused the engines to rock and "sidesaw" dangerously when run at anything exceeding a very ordinary speed, but if one became derailed even at moderate speed, it almost invariably turned nearly end for end, and often finished by upsetting. A number of the employees not only met with serious injuries from this cause, but in two or three instances were killed instantly. After a number of such accidents, the railroad company began late in 1862 to take out these leading wheels from some of the Perkins engines and adapt the frames at that point to the use of the standard four-wheel swinging trucks. In practice this change was found to somewhat prevent the "sidesawing," but did not altogether overcome the tendency to turn around when the engines were derailed, and as the larger engines which were rapidly coming into service on the road were relegating the Perkins engines to yard service, six were allowed to remain as first built. All showed records of service for periods ranging from eighteen to twenty-four years with the company, and an official of the Westinghouse Air-brake Co. informed me in 1897 that one, which had been sold by the Pennsylvania to a railroad in Oregon, was still running at that time.

In 1856 three Smith & Perkins engines were built for the Pennsylvania Railroad, which were believed to be a great improvement over their predecessors. The boilers were of wagon-top form with the domes on the center of the waist sheets. The safety-valves were on the dome covers, and both domes and covers were encased in neat jackets of polished brass. This material was also used for bands around the boiler casing and for covering the cylinders. The whistle stands passed up through the circular sandboxes, and the bells were on the roof-sheets, in front of the cabs. The driving-wheels were somewhat spread and the rear pairs were under the rather shallow fireboxes. The pumps were behind the drivers as on the other engines, but the return cranks from which they were driven, were on the main pins. The valve-gear on these three engines was of the suspended link, or Gooch, type. Wheels, cabs, sandboxes, dome-bases and cowcatchers were painted vermilion. These three engines were transferred in 1858 to Western lines which afterward became parts of the present Pittsburg, Cincinnati, Chicago & St. Louis, and I am credibly informed that one of them which had been renamed "Mingo Chief" at the time of the transfer, continued in service until 1881.

The handrails and bells, with the supporting posts of both, and the builders' badge-plates, were of polished brass and uniform design on all of the engines thus far described. The badge-plates were neatly engraved, and were mounted on blocks of polished hardwood



The Goliah.

on the sides of the boiler jackets, directly below the bells. The principal dimensions of the engines were as follows:

	Weight	
	On drivers.	Total.
First 2 Penn. R.R.	41,800 lbs.	54,200 lbs.
2 Allegheny Portage	50,500 "	61,500 "
10 Penn. R.R.	44,600 "	55,800 "
Last 3 Penn. R.R.	44,400 "	60,600 "
Cylinders, of all	17 in. x 22 in.	
Diameter of drivers	44 in.	
Diameter of leading wheels	30 in.	

The tenders of all the foregoing engines were also alike and differed only from other tenders in use in the type of center-bearing trucks used under them. The frames of these trucks were of wood. Two sills on the outside of each two pairs of wheels had the journal boxes attached to their ends by stirrup bolts which passed around the semi-circular boxes and up through the sills. A spring-plank was placed transversely between the wheels and extended slightly beyond the outside of these sills which were notched into it on their

under sides. Two narrow sills united at their ends by wide distance-pieces, crossed transversely over the tops of the sills and were also notched into them, and the whole frame was held firmly together by four bolts, two at each end of the spring-plank, which passed through the latter and the top pieces on the outside of the longitudinal sills. The journal boxes were very simple, consisting of a half-round cellar upon which a flat cap was placed, and this cap was shaped on its underside to retain the brass in position. The whole was then attached to the sills of the frame, as already described. Two circular springs of solid india-rubber were placed on the spring plank, one at each end, and a loose transom containing the center plate and side-bearing plates rested on the springs between the top transverse pieces and the side sills. Only one truck of each tender was fitted with a brake. As late as 1892 the writer saw a truck of this type in use under the tender of a Winans Camel engine on the Baltimore & Ohio Railroad, at Cumberland, Md. The only difference was in the use of the standard B. & O. journal boxes.

The tenders of the first four engines described were painted green and those of the other thirteen were resplendent in vermilion. All had the letters forming the engines' names painted in white on their sides and surrounded by a neat stripe of the same color. The frames of the trucks were painted in terra-cotta, with black ironwork.

The writer was very familiar with these engines from the days of his early boyhood when he made rather crude water-color sketches of them soon after they came on the road and while the original details were yet unchanged, until the time in later years when they began to pass into other hands, or the scrap-heap.

The illustration of the "Goliah" is from a photograph of a lithograph in possession of the Baldwin Locomotive Works. Neither the writer nor a number of people whom he has consulted who were familiar with the Smith & Perkins engines, ever saw one of them having the attachment to the outer end of the valve rod, as shown, and it probably was never reproduced in practice. The frames are also shown as terminating at the front of the firebox, as in Ross Winans' practice on the Camel engines. This was not the case on any of the other engines considered in this article, but was doubtless used on some of the engines built by the firm, as Mr. Perkins is known to have favored that arrangement of the frames, and to have used it in his later practice to some extent on the Baltimore & Ohio.

The cab is a very accurate reproduction of those on the engines when first built, and the other parts are correct in individual detail, except that no handrails were afterward used on the outside of the running boards. The connection to the water-space at the side of the smokebox is also shown very clearly.

A peculiar feature of construction followed by Smith & Perkins on the first 14 locomotives described should not be passed without mention. The English type of throttle connections was used in which the stem is partly rotated by a handle attached to its outer end at right angles, and moved crosswise of the cab by the engineman; a guard on the top of the stuffing-box preventing it from going beyond the arc of a circle necessary to give full steam or closed positions. This type never became popular with the officials or the enginemen, and after one or two years' service was taken off and replaced by throttle-stems and levers of the standard type. It was the only instance which has come under the notice of the writer of the use of "regulators" on engines built by American builders for use in the United States.

Of the personnel of the firm, I am informed that Mr. Smith, whose initial letters I have been unable to find, was the financial member and Thatcher Perkins the mechanical. The venture did not prove successful from a financial standpoint and was closed down in 1858. On December 1, 1859, Mr. Perkins became the Master Mechanic of the Baltimore & Ohio. The position was practically that of a superintendent of motive power of to-day. Thenceforth many of his mechanical ideas entered into the locomotive construction of the road. Among these were the form of tender truck already described; the Gooch link, of which he was a great admirer; the "buckhorn" stands for safety-valves which he applied to the Hayes 10-wheel Camels, and the use of a return cranks and their connections on the pins of the rear driving wheels to drive the pumps on the Winans Camels instead of the long rods from the crossheads with which they were originally equipped.

In 1865 Mr. Perkins resigned this position to become superintendent of the Pittsburg Locomotive Works, and it may be of interest to state that the salary accompanying the new position was five thousand dollars per year, not quite up to the present compensation for similar services. He subsequently resigned this position in Pittsburg to accept that of master mechanic of the Louisville & Nashville. He died in Baltimore, Md., in 1893. A portion of the buildings occupied by this firm is still standing and used in connection with other business.

It would be unfair to close this article without mentioning the obligation of the compiler and his readers to J. Snowden Bell, who was chief draftsman with Mr. Perkins at Mount Clare shops, and later at Pittsburg, Pa., and who has so willingly aided in securing the correctness of much of the data contained therein.

The Case of the Walschaert Valve Gear.

At a recent meeting of the New England Railroad Club the Walschaert valve gear was the subject of the evening, and while there was nothing absolutely new in what was presented, what was done may be taken as a general summing up of the present situation.

Everyone who spoke on the subject expressed a favorable opinion as to the working of the mechanism from the standpoint of maintenance and freedom from wear. It also appeared that the enginemen liked it, from the first, on account of its accessibility for oiling and inspection. This point was emphasized, as well as the great advantage resulting from the possibility of using the open space, left by discarding the eccentrics and rods, for frame bracing. The frames on the modern heavy locomotives need stiffening not only as individual members but in relation to each other. It is, therefore, safe to look for a reduction of the breakages of these parts. The modern Walschaert valve gear appeals forcibly to the mechanic, because it all lies in the same vertical plane. In looking down upon it there is little or no offset in any of the lines of motion, and this is an important matter. This does away with all tendency to twist and turn, and bending strains and deflections of one kind and another do not exist.

The criticism that the gear was all upon the outside and would, therefore, be easily knocked off when any slight brush with a car should occur, and the engine thus be put out of commission, does not hold; for, when the modern locomotive strikes anything, it is the other object that is pretty well done up; and after the wreckage is picked off from the front end, the engine continues on its journey.

With reference to the details of the gear, as it is now applied, the simplicity of every part of it is impressive. Not a rod nor a pin but is as simple and logical as it could be made, and there is nothing about it that need cause any apprehension as to its future development. If one part proves to be a little weak, an improvement can easily be made in it so that there will probably be no failures that time cannot remedy.

Although it appears that a saving of more than 1,000 lbs. can be made in this gear as compared with the Stephenson, it does not follow that the whole engine will be any lighter, because of the extra weight of the cylinder casting due to the moving out of the valve. Still there is an advantage in this saving of the weights of reciprocating or semi-reciprocating parts, so that the stresses due to momentum must be considerably reduced, and this accounts, in part, for the small pins that are used.

As far as steam distribution is concerned, the Walschaert gear possesses no particular advantage over the Stephenson when both are in good condition, and when the eccentric rods of the latter are long enough so that its maximum lead does not exceed $^{5}/_{16}$ in.; but, when the lead runs up to $^{7}/_{16}$ in. or more, there is an excessive pre-admission that is detrimental not only to the wearing of the parts but to the proper working of the engine.

In the case of the Walschaert gear, no instance could be cited where the pre-admission was more than one-half that amount, which was quite an item in its favor. Regarding the Joy valve motion, it has a constant lead, in common with the Walschaert; but it is more affected by the vertical movements of the boxes relative to the frame on an uneven track; and the cut-off at the moment the box is low in the pedestal is quite different from that occurring when it is higher, causing very irregular valve events at high speed. On a good, even roadbed, however, this is not objectionable, and the Joy gear is used to some extent in Europe but has not gained a predominating place. Its irregularities are more difficult to correct than are those of the Walschaert, and it must be very carefully worked out before being applied to an engine; while the difficulties of adjusting it in the roundhouse make it improbable that it will gain any footing in this country.

The general applicability of the Walschaert gear is shown by the types of engines on which it is used and the extent to which it has been introduced. It has been put upon all engines built for the Lake Shore during the last year or two. It is used extensively on the Pennsylvania, the 'Frisco, Big Four, Boston & Maine, Delaware & Hudson, Mexican Central, Delaware, Lackawanna & Western and others. It is used on nearly all types of modern engines; ten-wheelers, moguls, Atlantic, Pacific and switchers with possibly a preponderance of consolidations over any other one type.

The Prussian authorities are calculating the cost of electrifying the line of railroad between Altona and Kiel, 65 miles, with a view, if the installation should not seem too costly, to test electrical working for a heavy traffic on a first class railroad. This line is exceptionally straight and level and has a heavy passenger traffic, and for this reason is chosen for the experiment; but whether it is tried or not will depend on the cost of transportation and equipment.

GENERAL NEWS SECTION

NOTES.

The Cincinnati, Hamilton & Dayton has increased the pay of its telegraph operators.

The Minnesota legislature has passed a law making a reduction of 10 per cent. in freight rates generally throughout the state.

The Wisconsin Central Railroad and two of its officials, Burton Johnson and C. T. Huey, have been found guilty at Minneapolis of giving rebates.

The Corporation Commission of Virginia has imposed a fine of $500 on tne Southern Railway for violation of the demurrage rules of the commission.

The Mexican Central, having employed train auditors for some time, has decided to have them on all passenger trains. This will require 70 or 80 men.

In a suit against the Chicago, St. Paul, Minneapolis & Omaha and H. M. Pearce, Acting Freight Agent, charging illegal freight rates, a jury at Minneapolis April 11 returned a verdict of guilty.

The Long Island road has notified the men in its large shops that an employee who loses his season pass must thereafter pay his fare. It is said that the men in these shops have been losing 15 passes a month.

The state railroad commissioners of Massachusetts have written to the New York, New Haven & Hartford calling attention to the employment of passenger brakemen to do the work of conductors and baggage men, which, it is declared, is a kind of economy which amounts to a plain violation of the law.

It is announced in the newspapers that the trunk line railroads have decided not to make any increase in freight rates. The classification committee has held a number of meetings and it was expected that the rates on many commodities would be raised by changing the articles from a lower to a higher class, but it has been decided that the present is not a favorable time to make such an increase.

The State Railroad Commission of Texas has issued a notice requiring the railroads to show cause why they should not be made to increase by 25 per cent. their track and yard facilities at Dallas, Houston, San Antonio, Fort Worth, Sherman, Denison, Waco, Cleburne, Hillsboro and Austin. If the proposed order is issued it will necessitate the expenditure of at least $3,000,000 by the railroads in these improvements.

In a suit against the New York Central & Hudson River in the Federal Court at Syracuse, charging the payment of unlawful rebates by the road to the General Electric Company, the jury last week disagreed, after having been out 19 hours. On goods forwarded the railroad company made to the General Electric Company an allowance for switching, the G. E. having switching engines to handle cars within its yards.

According to a Chicago paper railroads in the West are complaining that the car inspectors of the Interstate Commerce Commission, who, it is declared, are always selected from the labor unions, are often unduly severe in their criticism of unimportant and non-dangerous defects in cars, and that this critical attitude is most manifest on roads against which the labor unions have for the time being an unfriendly feeling. It is claimed that these unreasonable criticisms delay much freight.

The Interstate Commerce Commission, in the suit of Van Camp against the Chicago, Indianapolis & Louisville, has decided that cement burial vaults, being heavier and less costly than iron burial vaults, should be carried cheaper; that is to say, at third class rates instead of second, which latter is the rate on the iron article; and it is ordered that beginning June 1 the classification must be thus changed. This being the Official Classification the order affects all of the other roads in that territory as well as the one more particularly complained of.

The United States Circuit Court of Appeals at Chicago has affirmed tne conviction in the District Court of the Chicago & Alton Railroad, and John M. Faithorn and Fred A. Wann, ex-officials of the line, for granting rebates. The railroad was fined $20,000, and the officials $10,000 each. The rebates had been granted to the Schwarzschild & Sulzberger Company in the shipment of meats, a "refund of terminal charges," of $1 on each car for the use of the tracks of the packing company. In its opinion the Court of Appeals says: "The trouble in this case comes from the fact that the railroad did not take a lease of the tracks of the packing company for the purpose of discharging its undertakings as an interstate common carrier. The arrangement between the two corporations was, therefore, a device whereby the produce of the packing company was transported at a cost of $19 per car, while other shippers were paying $20. The court excludes from the case as not being within the issues, the question of the right of a railroad company to tender greater service or to furnish greater facilities to one shipper than to another at the same published charge."

The Interstate Commerce Commission's regulations for keeping accounts will be promulgated to the railroads on May 15, to become effective July 1. Monthly, quarterly, semi-annual and annual reports of earnings will be required. Prof. Henry C. Adams, statistician, thinks of proposing to make every head accountant of a railroad a sworn agent of the government. By the plan of accounting, every transaction involving the payment of money will come under the supervision of the accountant. Not a rebate, for instance, could be granted without his being involved in the transaction. By making him an agent of the government Mr. Adams believes that the government would be in the best position to enforce the law and to guarantee that the letter of published tariffs is enforced in making and collecting charges.

Trans-Missouri Freight Bureau is to stop the practice of loading wool for buyers, the new law making it illegal to do such loading. The Oregon Short Line is understood to be opposed to the proposition and to have notified the chairman of the bureau that it will not be governed by the ruling. It has been customary for 10 years for the railroads to send out men to receive wool for buyers at the different shearing pens along the line of the western roads. It was the duty of these agents to receive the wool from the growers, weigh and check it, mark the sacks, make the invoice and pay the grower with signed blank drafts left with them for that purpose by the buyer. The grower was thus relieved of all trouble and delay. All this is now to be done away with, except on the O. S. L. Growers will have to wait until buyers get their particular lot of wool in order to receive pay for it.

In the federal district court at Chicago last week the Standard Oil Company was found guilty by a jury on an indictment citing 1,463 separate cases of underbilling committed from September, 1903, to March, 1905—each carload shipment in that time at the special secret rate being counted a distinct offense. The law provides a minimum fine of $1,000 and a maximum of $20,000 for each offense, so that if the verdict stands the company will have to pay a fine of at least $1,463,000. The railroad company, the Chicago & Alton, had given a rate of 6 cents per 100 lbs. from Whiting, Ind., to East St. Louis, Ill., when the published rate was 18 cents, and a rate of 7½ cents had been given to the Standard on shipments from Chappell, Ill., to St. Louis, Mo., when the published rate was 19½ cents. These lower rates were never published nor filed with the Interstate Commerce Commission. The chief contention of the defense was that neither the Standard Oil Company, nor its agents, knew or could be expected to know that the rate was a special or a secret rate. But Judge Landis, in charging the jury, held that it was the duty of the defendant "to endeavor diligently in good faith to get from the railroad company the lawful rate" by applying for it.

President Diaz on Railroad Progress in Mexico.

In a message to Congress, President Diaz reviews the progress of railroad building in Mexico as follows:

The Tehuantepec National Railroad, connecting the ports of Coatzacoalcos and Salina Cruz, a new transcontinental route, was recently inaugurated. Although the port works at Coatzacoalcos and Salina Cruz are not entirely completed, there is protection for shipping, with facilities for loading and unloading, thus establishing the first steps toward rapid communication between the Pacific and the Atlantic oceans, after many and costly efforts had been devoted elsewhere to the achievement of an object of so much importance to the commerce of the world.

Since September last the construction of new railroads, subject to federal jurisdiction, has been a little more than 125 miles, and the present length of all the railroads in Mexico under federal jurisdiction is 10,941 miles, which, added to the 2,640 miles of road that were built under state concessions, make a total of 13,581 miles of railroads in Mexico.

Partial plans for location of an important line from Guadalajara to Alamos have been approved by the federal authorities. Four hundred new freight cars have been bought for the Tehuantepec National, of which 68 have been delivered. In addition, 236 freight cars have been built in the shops of that road since last September. On the railroad that runs between Ensenada and Tijuana, repairs have been completed for 60 miles. The federal board of rate revision has examined and discussed 256 rates of railroads of the

Republic, and it is at present engaged in making a general revision of rates of the express companies and in drawing up new regulations.

What Is Greatness?

One hundred and fifty cars loaded with freight for Peekskill are sidetracked between Peekskill and Ossining. It looks as though some of them would not reach this village before summer. A local feed merchant reports a car of corn 46 days from Buffalo, and spoiled; another cargo six weeks and two days from Albany. And this is "America's greatest railroad!" Pray, what and where is America's smallest railroad? Let's give it a chance to show what it can do.—*Highland Democrat*, Peekskill, N. Y.

Trouble in the Canadian Northwest.

D. D. Mann met a committee of the Board of Trade at Winnipeg yesterday to discuss the complete tieup of the Canadian Northern Railway. He assured them that all possible is being done, but the motive power is crippled and the company finds the greatest difficulty in coping with the adverse conditions. The settlers who have been delayed so long in the Winnipeg yards were pulled out yesterday, but many of them have lost valuable stock and the balance of the animals are so weakened by confinement and lack of food that they will die before reaching the end of the long railroad journey yet ahead. The dead animals are lying just where they have been dumped out of the cars. One of the chief causes of the road's predicament is the fact that it has no shops here or along the system capable of repairing properly or promptly the locomotives, and in consequence of the severe winter and trying conditions the engines are in very bad order.—Winnipeg Press Despatch, April 11.

Block Signals on the Ulster & Delaware.

The Union Switch & Signal Company has contracted to equip with automatic block signals the line of the Ulster & Delaware from Kingston, N. Y., to Phoenicia, 25 miles. This line is single track and in the summer carries a heavy passenger traffic, being one of the principal routes to the Catskill mountain region.

Signals for the Pennsylvania Tunnels.

The Union Switch & Signal Company has taken the contract for the block and interlocking signals for the new Pennsylvania Railroad terminals in New York City, the tracks of which will not be laid for many months yet. This is said to be the most extensive signal contract ever signed. The lines covered by it extend from the Passaic river at Newark, eastward across the Hackensack meadows, and underneath the North river, Manhattan Island and the East river, and thence to the Sunnyside yard, about four miles out on the Long Island road.

New Railroad Laws in Iowa.

The Iowa Legislature adjourned last week. The following bills were passed affecting railroads:

Anti-pass law, conforming practically with the federal law.

Requiring roads which have income of $4,000 a mile to sell tickets at 2 cents a mile; those having less, and more than $3,000, 2½ cents a mile, and those having less than $3,000, 3 cents a mile.

Requiring railroads to build fences on both sides of their rights of way.

Authorizing the reconsignment without charge to a new destination of property forwarded by a common carrier.

Authorizing persons, firms or corporations engaged in the business of storing for profit to issue warehouse receipts on goods so stored; to regulate the issuance, negotiation and transfer of such receipts, and to provide punishment for violation of said regulations.

Defining relations between employer and employee with respect to assumption of risk.

Giving railroad commissioners same power over express companies as over railroads.

To require railroad corporations to cut and burn or otherwise destroy certain noxious weeds.

Providing for reports and investigations of accidents on railroads.

Appropriating $5,000 to enable the railroad commission to investigate freight rates.

Enlarging the powers and duties of the board of railroad commissioners.

Requiring vestibules on street cars to be enclosed on all sides.

Permitting city railways and interurban lines to construct lines over rural roads which are 100 ft. wide.

Permitting the construction of tracks and operation of automobile interurban railroads.

Among the bills that have failed were the reciprocal demurrage law, the reduction of sleeping car rates, the live stock freight speed limit measure, the bill requiring state examinations for railroad telegraph operators, and the bill regulating the hours of service of employees.

Southern Pacific Telegraphers' Wages and Vacations.

The board of arbitration which considered the dispute between the Southern Pacific and the Order of Railroad Telegraphers, handed down its decision April 6 awarding the telegraphers 7½ per cent. increase in pay and a half day's work on Sunday, or in lieu thereof a vacation of 26 days in each year, with full pay. The Southern Pacific gained its contention that the telegraphers should not "legislate" for train despatchers or for station agents whose salaries or commissions equal or exceed $1,300.

A Heavy-Capacity Ball-Bearing Jack.

A ball-bearing bridge jack of 75 tons capacity is shown in the accompanying illustration. Near the top of the screw, supporting the ball-bearing thrust, is a spur gear which meshes with a pinion also horizontally maintained by a vertical, stationary shaft in the gear box. The pinion is keyed to a bevel gear which lies beneath it and through which the shaft also passes, the bevel gear resting on a shoulder which rises to a proper height about the shaft. This latter gear is actuated by a smaller bevel gear vertically maintained and made integral with a horizontal shaft and ratchet. All gears are thus positively supported. The steel parts are machine cut from solid steel forgings, insuring accuracy. The screw is cut with a double pitch, which not only increases the efficiency, but gives greater speed, and this, combined with the special gear mechanism, enables the operator to handle heavy loads without loss of speed. By use of a crank handle the jack is quickly run up to the load, before the bar is inserted to perform the lift.

A Heavy Capacity Ball-Bearing Jack.

The strength of the design is apparent from the illustration. The head and gear box are reinforced against vertical and side stresses by strong ribs. The material used is carefully selected and parts are fitted with accuracy, so as to reduce friction and wear to the lowest degree and promote ease of operation.

The ball arrangement is worthy of note. Instead of permitting the balls to touch one another, they are placed in individual openings in a phosphor bronze cage, thus minimizing the friction, with consequent ease of operation and lower cost of repairs. The cage openings are placed irregularly to give the maximum wearing surface on the thrust plates. These jacks are tested in a hydraulic testing machine to an excess load of about 20 per cent., before shipment. They are made by the Buda Foundry & Manufacturing Co., Chicago.

Initial Carrier Responsible for Delays.

The Supreme Court of Virginia, in the case of Wilkinson against the Norfolk & Western Railway and the Old Dominion Steamship Company, has held that where a shipper makes a claim for loss by delay to a shipment of freight, which has been carried over two or more lines, proof of the delay makes out a prima facie against the initial carrier; the burden of proof is not on the plaintiff to show which of the two or more carriers is responsible. Justice Cardwell, in delivering the opinion of the court, said:

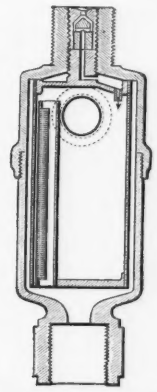
"It would be a manifest denial of justice, as it seems to us, if the law withheld from a shipper, in such a case as this, the right of recovery, where from the nature of the case he is powerless to trace the negligence to the particular carrier concerned, and where, perhaps by agreement between them, each declines to introduce evidence to establish its own freedom from negligence, because the establishment of this freedom from negligence of the one would place the fault on the other."

The Graphoil Locomotive Graphite Cup.

Owing to the fact that graphite has a higher specific gravity than most viscous oils it has been difficult to properly mix and feed it with lubricating oil and its application to bearings and rubbing surfaces where its superior qualities as a lubricant would effect a saving has been somewhat limited. This is particularly true of steam engine cylinders and valves. With oil alone the lubricant is washed off and dissipated to a considerable extent under high steam pressures and the action of condensed steam. The accompanying illustrations show a new device for automatically mixing just the right amount of graphite with the lubricating oil which has been designed to meet the conditions peculiar to the cylinders and valve chests of a steam locomotive.

The cup is simple and strong in construction. There is an inner and an outer cup and between these two is a steam space which serves to equalize the pressure in and around the inner cup, and also serves to prevent condensation in the inner cup. Inside

Graphoil Locomotive Graphite Cup.



Section Through Cup.

the inner cup is an upright brass tube, open at the top and bottom. One side of this tube is cut away, and brass wire cloth of suitable mesh is substituted to take the place of that part of the tube which has been cut away. The oil flows or is forced into the inner cup, passes over and takes up the surface of the graphite, then goes through the meshes of the wire cloth on the upright tube, down the tube to the valve chest and cylinder, each drop of oil fed carrying the right proportion of graphite, which adheres to the wearing surfaces and will not wash off.

The graphite cup is constructed to be readily adapted to the oiling system already installed. At the bottom of the cup is a hexagon with female thread to take the oiler plug on the valve chest. At the top is a threaded shank, which also carries a check valve, to receive the union nut by which it is connected to the oil pipe from the sight-feed lubricator in the cab. The check valve effectively prevents any back pressure forcing the graphite up into the oil pipe under any conditions.

The best results are obtained by using Dixon's pure flake graphite No. 2 mixed to the consistency of putty with cylinder oil. A filler is furnished with each pair of cups, which is designed to hold enough graphite to fill a pair of locomotive graphite cups. A full cup is sufficient for an average round trip.

The Graphoil locomotive graphite cup is one of a line of similar specialties for feeding graphite with oil, made by the Comstock Engine Company, Brooklyn, N. Y.

Troubles of Government Ownership in Italy.

Senator Colombo has written a long letter to the *Corriere della Sera*, in which he points out that the government employs no settled or reasonable policy in dealing with railroad problems. For instance, a commission has plainly stated that electric traction would meet the deficiencies in the service between Bologna and Florence only up to about 1915, and that the necessary alternative was a new road with easy gradients and a 10-mile tunnel, which would take seven years to put through and would thus barely be in time; but the authorities merely talk of adopting electricity, and have permanently shelved the question of the new line. The traffic between Milan and Genoa is increasing at a rate that makes it much more likely that it will be doubled in 1913 than in 1920, while, even according to the most sanguine estimate, the new direct line indispensable under such circumstances could only be ready, if begun at once, in 1914. Yet the government proposes half measures. The excuse is that the sums required are too large to be decided on off-hand; but the Senator replies that the Ministry, as far back as 1905, admitted the necessity of making new lines from Bologna to Florence and from Milan to Genoa, without further delay, that private capital is ready to furnish the money required for the latter, and that it would be better to spend $25,000,000 on the former, which is the main railroad of Italy, than to divide the whole of the $182,000,000 voted into a number of small sums, none of which will effect any serious improvement in the present state of affairs.

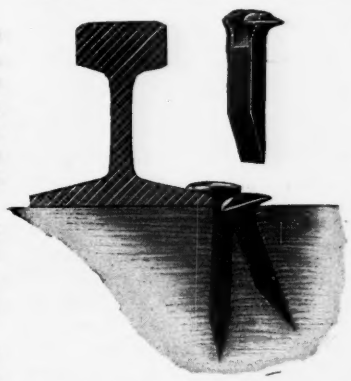
How serious this is may be judged from the fact that Genoa has been furnished with 11,835 cars less between October and January than during the corresponding period last year; the Railway Administration, which pleads the increased calls upon it in extenuation of its failure to meet them, having acted, on the contrary, as if these calls had diminished. Hence not only the docks and quays, the lighters and other vessels, but all the old hulks that can be found, are filled to overflowing with goods of every kind, and even the sea itself has been laid under contribution to eke out the insufficiency of the available warehouse accommodation, timber being chained together and anchored down in the water. At Genoa the merchandise awaiting transport is estimated at 600,000 to 1,000,000 tons, and of this there are at least 280,000 tons of coal, an accumulation daily increasing by about 8,400 tons. Horses have begun to be resorted to, and some 65,000 tons have thus been carried out of the town during the past month.

Venice, too, has been treated by the railroads as if her traffic had been halved; and as an instance of this it may be stated that between the 10th and the 25th of February that city was furnished with 2,533 coal trucks less than had been applied for. Among the results of this treatment of the Italian ports is that coal is being sent into Italy from Germany, instead of by sea, and that Trieste is beginning to supplant Venice as a landing place for goods sent to the Venetian region.

One great cause of inefficiency is the creation of unfamiliar conditions, which began when the government, in order to fight the Southern (Meridionale) Company, changed the routes by which goods had always been sent, and which was made worse when the "Mediterranea" and "Adriatica" personnel and rolling stock were consolidated. The men have to deal with signals and regulations new to them, while the repair of engines and other vehicles in workshops where they are a novelty leads to a chaos better imagined than described. The 21 subdivisions of authority at headquarters, all independent of one another, are a further constant source of delays and contradictory orders, and the wonder is, the paper concludes, that trains run at all.—Milan Correspondence *London Times*.

The "Spike Strut" Rail Fastener.

The accompanying illustration shows an ingenious and simple device for reinforcing the outside spikes on a rail to prevent spreading of the gage and loosening of the spikes under the tilting action of rails on curves. The strut is headed up like a standard spike but is made larger in the shank. The point is chamfered with a chisel end and the inside of the head is slotted on angle of about 30 deg. to the width of the standard spike shank. In driving the spike strut the track is first set accurately to gage and the strut started straight with the point about the width of a spike from the edge of the rail flange. The bevel of the point will cause the strut to take the proper angle. When the strut has been driven until the head is about an inch from the surface of the tie, the track spike is inserted in the slot in the head of the strut and driven until the two heads are together. Both are then driven home until the track spike firmly overlaps the rail flange. It is claimed that these spike struts will perform the same functions as tie plates or rail braces; that they will hold the track absolutely to gage and will prevent the track spikes from working loose and letting sand and water get under the rail. They are adapted for use on curves and at rail joints, frogs and switches. The Maryland Railway Supply Co., 510 Continental Building, Baltimore, Md., is the maker.



The "Spike Strut" Rail Fastener

American Locomotive Company's Jamestown Exhibit.

The American Locomotive Company's exhibit at the coming Jamestown Exhibition will occupy a plot 100 ft. x 250 ft. in the southern part of the grounds on the southeasterly side of Lee's parade grounds. The exhibit will be housed in a building, especially built for the purpose, 177 ft. long and 20 ft. wide, with the entrance facing the parade. The exhibit will consist of one consolidation type locomotive built for the Southern Railway, with 22 in. x 30 in. cylinders and Walschaert valve gear; a Pacific type passenger locomotive built for the Chesapeake & Ohio with 22 in. x 28 in.

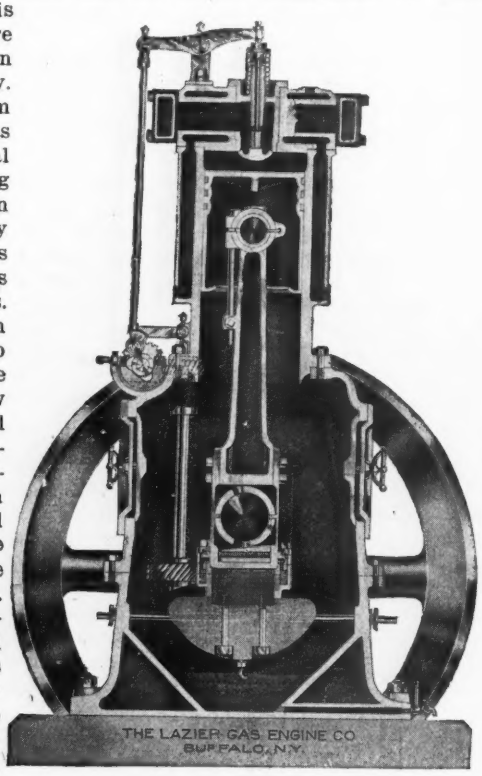
cylinders and piston valves; a 10 in. x 16 in. saddle tank contractor's locomotive and a class 44-16-2½ Atlantic steam shovel. The steam shovel will be outside of the building and will be in operation under its own steam.

A New "Car-Ferry."

General Manager Miller, of the Chicago & Eastern Illinois, with a party of friends has started for New Orleans in two private cars which are to be loaded upon river barges and then towed behind a steamer to New Orleans. The party left Chicago April 13 for Joppa, the southern terminal of the Eastern Illinois in Massac County, on the Ohio river near Cairo. A specially prepared incline has been made to the wharf. There will be a baggage car for the storage of supplies. The trip down the Ohio and Mississippi rivers will be a leisurely one, and after reaching New Orleans a tour of the south will be made.—*St. Louis Globe-Democrat.*

The Lazier Gas Engine.

In designing the Lazier gas engine, shown in the accompanying illustration, the chief aim has been simplicity. The valves are mechanically operated and all of the mechanism by which they are actuated is on the outside, where repairs and inspection can be made readily. The cams and cam shaft run in oil as well as the spiral gears transmitting motion from the main shaft. There are only four of these gears and their operation is almost noiseless. Provision has been made for taking up lost motion in all the moving parts. A new design of extended take-up has been applied to the connecting rod, as shown in the illustration. All the interior parts are lubricated by the "splash" system. Double ignition is provided, so arranged that the two systems may be used singly or in combination, and so that the operator can vary the time of firing the charge at will while the engine is running. The engines are furnished with automatic self-starters. They are made in sizes from 2 to 300 h.p., and will operate on alcohol, kerosene, distillate, illuminating gas or producer gas. It is claimed that with coal at $3 a ton, 10 h.p. hours a day can be produced at a cost of $4 per year. These engines are made by the Lazier Gas Engine Co., Buffalo, N. Y. A. A. Lazier, the president of the company, recently disposed of his interests in the Lazier Engine Manufacturing Co. to form this new concern, which makes the improved type of engines bearing his name.



The Lazier Gas Engine.

A Railroad Commission in New Jersey.

The legislature of New Jersey has passed a law to establish a state railroad commission. The Governor says that he has selected the men to fill the board, but will not announce their names until after he has examined the bill in detail.

Increased Operating Costs.

As bearing upon pending legislation to reduce passenger fares, increase taxes and involve the railroads in large expenditures that yield no return, a statement has been prepared by the Pennsylvania showing the increases that have already taken place in railroad taxation, in cost of materials used by the railroad and in wages.

A careful computation made by the purchasing department of the company shows the following increases in cost of standard railroad materials from 1904 to 1905, the prices for the latter year being generally maintained, or increased, up to the present time: Axles, 25 per cent.; iron castings, 37½ per cent.; pig iron, 21½ per cent.; hemlock lumber, 42.80 per cent.; pig copper, 23.96 per cent.; steel billets, 27.6 per cent.; car wheels, 11 per cent. Thirty other commodities show increases in price, ranging from 1.70 per cent. for white lead, to 26.40 per cent. for phosphor bronze. Freight car equipment costs from 10 to 12 per cent. more. Locomotives about 5 per cent. more. Fuel from 5 to 10 per cent. more.

The figures just given indicate the increased cost of building and maintaining a railroad. The expenses of operation are likewise greatly increased by the larger wages now paid. The 10 per cent. increase in wages, voluntarily made by the Pennsylvania Railroad Company on December 1, 1906, affected about 185,000 men.

Last year the taxes paid by the Pennsylvania lines east of Pittsburg and Erie aggregated $5,202,206, an increase of more than 30 per cent. over 1905.

Electric Railway Earnings in 1906.

The *Commercial and Financial Chronicle* has collected figures of earnings for as many street and electric railways as would furnish the information, and has published the totals, which are summed up in the following table. This includes three classes of roads, those whose returns cover, respectively, the calendar year, the year ending September 30th and the year ending June 30th. The following important companies are not included: The Chicago Union Traction lines, the Cleveland Electric Railway, the Cincinnati Street Railway, the Indiana, Columbus & Eastern Traction, the Public Service Corporation of New Jersey, the Pacific Electric Railway of California, the Los Angeles Interurban Railway, the Omaha & Council Bluffs Street Railway, the Virginia Passenger & Power Company, the Spokane & Inland Empire and the Wheeling Traction. The table follows:

		Gross.		Net.	
	Roads.	1906.	1905.	1906.	1905.
For calendar year..	181	$215,153,525	$192,672,458	$92,442,309	$82,873,597
Year end'g Sept. 30.	85	23,708,187	21,903,055	6,798,100	6,362,720
Year end'g June 30.	202	61,705,741	55,020,038	27,339,786	24,787,759
Grand total	468	$300,567,453	$269,595,551	$126,580,195	$114,024,076
Increase		30,971,902 (11.49%)		12,556,119 (11.01%)	

Fifteen Passengers Killed at Chapleau, Ont.

In the derailment of westbound passenger train No. 1 by a broken rail on the Canadian Pacific at Chapleau, Ont., on the night of April 10, 15 passengers were killed and 34 were injured. Five tourist cars in the middle of the train fell down a bank and one of them was entirely submerged in a lake. Of the cars above the water one took fire, and the passengers who lost their lives were in most cases burned to death.

Long Interurban Road in Italy.

Consul J. E. Dunning reports that an electric railway is to be built from Genoa to Milan, Italy, 85 miles.

State Reductions of Passenger Fares.

The Governor of Michigan has signed the law limiting passenger fares, and it goes into effect 90 days after the adjournment of the legislature. On the larger roads of the lower peninsula the rate is to be 2 cents a mile, and on the upper peninsula 3 cents. An officer of the Pennsylvania Railroad has said that the reduction recently ordered in the state of Pennsylvania by the legislature will decrease the passenger earnings of that company about $2,000,000 yearly. The West Virginia act limiting passenger fares to 2 cents a mile, takes effect April 22. The newspapers say that the railroads intend to resist the law on the ground that its exemption of lines less than 50 miles long is unconstitutional.

Another Morse Purchase.

According to press despatches, the Morse Steamship Company has bought the two Joy Line steamers which have been carrying on outside service between New York and Boston. The Joy Line will hereafter operate lines to Fall River, Bridgeport and Providence only.

Coal Handling at Sandusky.

By replacing the old Thornburg car dumper at Sandusky, Ohio, with a McMyler machine of the latest model, the Pennsylvania lines will be able to send out 1,000,000 tons of coal this year from Sandusky; the amount sent out last year was 475,000 tons. The new car dumper on the water front is nearly finished and will be in full operation next month. It is so constructed that when a coal car approaches, a smaller car, called "the goat," rises from a depression between the rails, meets the loaded car and pushes it upon the platform of the dumper. At the same time it pushes off the car which has been emptied. Then the platform bearing the big car, with 60 tons of coal aboard, is raised by cables until it reaches the level of a chute. Cables then clutch one side of the car, turn it over and the coal rushes down the chute into the hold on the wait-

ing vessel. When a car is emptied it rolls off the dumper, down an incline, and into the yard for empties. The dumper has a capacity of 25 cars an hour. This means that every hour 1,500 tons of coal can be loaded into the ships alongside. A 175-car storage is one of the new improvements. The approaches and docks have been rebuilt and the channel near its docks dredged out.

I. C. C. Decisions.

The Interstate Commerce Commission has announced decisions in cases as follows:

In the case of Omaha Grain Exchange v. Union Pacific, it appeared that the carrier has in force a rate of 1 cent per 100 lbs., minimum charge $5 per car, for transferring grain in carloads from Council Bluffs, Ia., to Omaha and South Omaha, Neb. Its rate for transferring grain from Omaha and South Omaha to Council Bluffs for delivery upon its own tracks is $2 per car, which was put in to induce construction and maintenance of a modern and capacious elevator on its line in Council Bluffs, and a higher rate is charged by it on grain transferred to Council Bluffs for delivery to elevators or industries on other lines. The delivery of grain by the carrier in Omaha or South Omaha is for industries or elevators on other lines, for which, under car-service rules, it must allow such other line $2 per car per diem rental. The grain rates from the West to Omaha, South Omaha and Council Bluffs are the same, while from the East the rates to Council Bluffs are less than to Omaha or South Omaha. The charge from Council Bluffs to Omaha and South Omaha was complained of as unjust and unreasonable. Upon all the circumstances and conditions the Commission, in an opinion by Commissioner Clark, holds that the complaint should be dismissed.

The case of James B. Mason against the Chicago, Rock Island & Pacific involved alleged exaction of unreasonable demurrage charges by the carrier, and the complainant asked for an order of the Commission authorizing receivers of interstate freight over the carrier's line of railroad and other lines of railroad hauling interstate freight to deduct from the freight charges a reasonable sum per day for each day the carrier or carriers retain possession of any interstate shipment for a longer time than is required to haul such shipment from point of consignment to place of destination, after allowing every carrier one hour for every thirty miles from point of consignment to place of destination. The Commission, in an opinion by Commissioner Clark, holds that it is without authority to fix rules or regulations for reciprocal demurrage.

In the case of Johnston-Larimer Dry Goods Company against the Wabash and others, the rates complained of were those on cotton piece goods from East St. Louis, Ill., to Kansas City, Mo., and from East St. Louis to Wichita, Kans., but the real question involved was the differential in rates from eastern markets to Kansas City and Wichita, which is 57 cents via all rail and 44 cents via rail and water routes in favor of Kansas City, the rail and water routes being via Galveston, Tex., and two of the lines passing through Wichita to Kansas City. The Commission, in an opinion by Commissioner Prouty, holds that the rate of 35 cents, East St. Louis to Kansas City, is not excessive; that the rate of 66 cents, Kansas City to Wichita, is extremely high for the distance of 222 miles, but for reasons stated a reduction would not benefit complainant at Wichita and might result to its disadvantage and would involve a ruling either that rating cotton piece goods as first class in the Western Classification is wrong, or that the class rates between the Missouri river and Chicago are too high. The opinion states that no reason appears why the classification of cotton goods should be changed, or the class rates reduced at this time. The rates from the East and the differential mentioned were not the subject of complaint, nor are the water and rail lines parties to the proceeding. The complaint is dismissed without prejudice to further proceedings.

In the case of Johnston-Larimer Dry Goods Company v. New York & Texas Steamship Company and others complaint was made that the rate of $1.61½ per 100 lbs. on knit goods from New York and New York rate points via water and rail through Galveston, Tex., to Wichita, Kans., is unlawful, and with this was compared the carriers' rate of $1.31 on that traffic through Wichita to Topeka, Kans. The decision of the Commission, in an opinion by Commissioner Prouty, holds that the difference in rates is justified by competition for traffic to Topeka, which does not exist, and apply with like force at Wichita, and that the rate to Wichita is not, under the circumstances, shown to be unreasonable.

In the case of the Johnston-Larimer Dry Goods Company against the Atchison, Topeka & Santa Fe and others it appeared from the evidence that the carriers' rates per 100 lbs. on cotton piece goods from various producing points in Texas are 96 cents to Wichita, Kans., 50 cents to Kansas City and St. Louis, and 55 cents to Omaha and Chicago. The average distances range from 458 miles to Wichita to 1,038 miles to Chicago. Active market and carriers' competition exist for the sale and transportation of this traffic to the points other than Wichita, to which substantially agreed rates are maintained by the four carriers reaching that point from all markets. A rate from Texas producing points to Wichita of 50 cents per 100 lbs. would be highly profitable to the carriers and complainant. A Wichita jobber formerly had, by the rebate system, a rate as low as 50 cents. Until recently the tariff rate to Wichita from these points was $1.16. The present rates to Kansas City and other Missouri river points and to Wichita exclude the Wichita jobber from competition. The Commission, in an opinion by Commissioner Prouty, holds that the present rate of 96 cents to Wichita is unreasonable, and orders a reduction to 50 cents per 100 lbs. in the rate on cotton piece goods from specified Texas shipping points to Wichita. The rate from Galveston to Wichita is not included in the decision.

In addition to the decisions in contested cases mentioned above the Commission, in an opinion by Commissioner Harlan, announces its decision upon the petition of the Frank Parmelee Company. This company is a common carrier engaged in Chicago in transferring passengers and baggage between railroad stations and between such stations and hotels and private residences, and performs a service connected with interstate passenger traffic, but is, nevertheless, not a carrier subject to the provisions of the Act to regulate commerce. The petition of this company asked for a ruling of the Commission upon the right of railroad companies to exchange free transportation with local transfer and baggage express companies such as the petitioner. The opinion of the Commission quotes the following language from section 1 of the Act to regulate commerce: "No common carrier subject to the provisions of this act shall, ... directly or indirectly, issue or give any interstate free ticket, or free transportation for passengers, except to its employees and their families, its officers, agents. . . . *Provided*, That this provision shall not be construed to prohibit the interchange of passes for the officers, agents and employees of common carriers and their families." The Commission holds that the proviso clearly modifies the main clause and is to be construed strictly, and that the words "common carriers" relate only to those referred to in the main clause—namely, the carriers subject to the Act. The opinion also holds that while the Frank Parmelee Company, not being subject to the regulating statute, may doubtless give free transportation on its omnibus and baggage express wagons to whomsoever it wishes, no common carrier subject to the jurisdiction of that Act can lawfully grant free transportation to the officers, agents or employees of the petitioner. Notice is taken of the specific exception of the Act as to "baggage agents" entering trains near large terminals to arrange for baggage transfer.

TRADE CATALOGUES.

Mine and Quarry.—The fourth number of Vol. 1 of the quarterly magazine of the Sullivan Machinery Co. contains articles on "Diamond Drills and the New York Water Supply"; "Tunneling with a Channeler"; "American Drills in a French Colliery"; "The Marble Industry in New York State"; "Tapping Water in Mines"; "The Mechanical Sharpening of Rock Drill Steel"; "Channeling Granite with Hammer Drills"; "Amount of Power Consumed in Cutting Coal," and "The Cost of Diamond Drilling." As the titles indicate, the magazine contains much matter of interest and value. All of the articles are fully illustrated, both half-tone and line engravings being used.

Buda Products.—Bulletins 105 to 109, inclusive, of the Buda Foundry & Mfg. Co., Chicago, are devoted respectively to Buda lining-up jacks, Buda replacers, Buda lifting jacks, automatic switch-stands, and Buda tool grinders. Each is standard size (6 x 9) and fully describes and illustrates the subject treated. Buda lining-up jacks were described and illustrated in the *Railroad Gazette* Nov. 30, 1906. The lifting jack catalogue contains 70 pages covering the large line of ball-bearing, cone-bearing, ratchet, friction and other jacks for special and general lifting purposes, made by this company. A Buda ball-bearing jack is described elsewhere in this issue.

Drills.—The Baldwin Steel Co. has published a complete catalogue of Hudson high-speed, tool steel, twist drills, reamers, taps, milling cutters, etc. The pamphlet, which has 79 pages, illustrates each tool and gives full dimensions and prices.

Manufacturing and Business.

The Lackawanna Steel Company, New York, has moved its offices to the United States Express Company's Building, 2 Rector street.

William S. Johnson, for the past 12 years Assistant Engineer of the Massachusetts State Board of Health, has opened an office at 101 Tremont street, Boston, for the practice of civil engineering.

Harrington Emerson has been appointed Standardizing Engineer of the American Locomotive Company, with office at 111 Broadway, New York, reporting to the Vice-President in charge of manufacturing, with authority to investigate and recommend standard methods of shop operation, shop accounting and handling material.

Gen. Eugene Griffin, First Vice-President and Manager of the Sales Department of the General Electric Company, died of apoplexy at Schenectady, New York, on April 11. General Griffin was born at Ellsworth, Me., in 1855, and graduated from West Point in 1875. He resigned as Captain of the regular army in 1889, and during the Spanish War organized and commanded a regiment of volunteer engineers, which saw service in the Porto Rican campaign. General Griffin had been First Vice-President and Sales Manager of the General Electric Company ever since it was organized.

The Federal Railway Signal Co., whose machine shop at Troy, N. Y., was completely destroyed by fire on January 31, has bought the property of the Albany Forge Company, which is on both the New York Central and the Delaware & Hudson at Albany, N. Y. The property consists of a completely equipped machine, pattern and carpenter shop and store room, which, together with machinery recently bought, will enable this company to commence at once the manufacture of signal material on the same scale as before the fire. The shops occupy a plot of 19 acres, giving room for future additions. Arrangements are being made to build an additional two-story building, 100 ft. x 350 ft.; also a machine shop and a building 60 ft. x 150 ft. for a foundry, the plant at Troy having been for months inadequate. On completion of these buildings the offices, foundry and blacksmith shop will be moved from Troy to the new location. The directors of the company are: Robert C. Pruyn, James H. Caldwell, J. T. Cade, Lawrence Griffith and P. G. Ten Eyck. The officers are: J. T. Cade, President; Lawrence Griffith, Vice-President; P. G. Ten Eyck, General Manager; Frederic Pruyn, Treasurer, and C. E. Newman, Secretary.

Iron and Steel.

The Monterey, Fresno & Eastern has ordered 20,000 tons of rails from the Lackawanna Steel Company.

Despatches from Chicago say that car builders are in many cases from 30 to 90 days behind in receipts of iron and steel.

The Carnegie Steel Company recently received orders for about 15,000 tons of rails and has booked a total of about 900,000 tons for delivery this year.

The International Railway Company of Buffalo has given an order for 2,500 tons of girder rails to the Lorain Works of the United States Steel Corporation. Negotiations are pending for between 25,000 and 30,000 tons.

The United States Steel Corporation opened its books on April 18 to receive rail orders for 1908 delivery. Early this week it was said that buying orders aggregating nearly 250,000 tons were awaiting the opening of the books.

The Chicago City Railway has ordered 10,000 tons of rails. The American Bridge Company will furnish the 15,000 tons of steel for the Susquehanna bridge to be built by the Baltimore & Ohio, and 1,600 tons for the bridge over T street in Washington, D. C. About 10,000 tons of steel will be required for the bridge over the Ohio river from Ambridge to the new works being put up by the Jones & Laughlin Steel Company.

OBITUARY NOTICES.

J. D. Sullivan, Superintendent of the Halifax & Southwestern, died suddenly at Bridgewater, N. S., on April 11. Mr. Sullivan was 38 years old.

M. L. Sykes, formerly and for many years Vice-President, Secretary and Treasurer of the Chicago & North-Western, died on April 17 at his home in Mount Vernon, N. Y., at the age of 81.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Engineers' Club of Philadelphia.

At a meeting of this club to be held April 20, there is to be a paper on "The Physical Properties of Cast-Iron" by James Christie.

Franklin Institute.

At a stated meeting of the Institute, April 17, an address was made by Professor V. Karapetoff, of Cornell University, on the "Human Side of the Engineering Profession."

South & Southwestern Railway Club.

At a meeting of this club in Atlanta, April 18, the program included the following subjects: "Electricity vs. Steam as Applied to Railroad Shops," for general discussion. The subject, "Cost of Locomotive Operation," was discussed by W. N. Cox, F. F. Gaines and J. H. Witten. There was also a discussion on the "Advanced Price of M. C. B. Material."

American Street & Interurban Railway Association.

The annual convention of this association is to be held at Atlantic City, N. J., October 14-18, 1907. The days upon which the different associations will hold their meetings have not yet been fixed. Hotel accommodation has been arranged for with 35 of the largest hotels, of which 13 are on the ocean front. A large convention hall, with a seating capacity of 800 people, will be provided on the steel pier for the opening of the American Association Convention, and smaller meeting rooms will be available for the various sectional meetings of the American, Accountants', Engineering and Claim Agents' Associations. Bernard V. Swenson, Secretary, 29 West Thirty-ninth street, New York.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Delaware & Hudson.—L. F. Loree, the new President of the Delaware & Hudson, was born at Fulton City, Ill., on April 23, 1858. He was educated at Rutgers College, and was later admitted to the bar. He began railroad work in 1877 in an engineer corps on the Pennsylvania, and from 1879 to 1881 he was in the Engineer Corps of the United States Army. During the next two years he was leveler, transitman and topographer on the survey of the Mexican National from the Rio Grande river to Saltillo. During the next 18 years he worked his way up on the Pennsylvania Lines West, beginning in 1883 as Assistant Engineer of the Chicago division of the Pittsburg, Cincinnati, Chicago & St. Louis. In 1884 he was made Engineer of Maintenance of Way of the Indianapolis & Vincennes division, and in 1886 was transferred to the Chicago division. Two years later he was transferred to the Cleveland & Pittsburg division, being made Superintendent of that division in 1889. He was appointed General Manager of the Pennsylvania Lines West in 1896. In 1901 he was elected Fourth Vice-President of the Lines West, but in a few months went to the Baltimore & Ohio as President. In January, 1904, he was elected President of the Rock Island Company; he resigned in October and was out of railroad work for nearly two years, spending most of the time abroad. In January, 1906, he was elected Chairman of the Executive Committee of the Kansas City Southern. This last position Mr. Loree will, it is expected, retain for the present in addition to his duties as President of the Delaware & Hudson.

Erie.—D. O. Mills has resigned from the Board of Directors.

Interborough-Metropolitan.—T. P. Shonts, President of this company, has been elected also Chairman of the Executive Committee, which is composed of the operating heads of the Interborough Rapid Transit Company, the New York City Railway, and the Manhattan Elevated.

Interborough Rapid Transit.—See Interborough Metropolitan.

Manhattan Elevated.—See Interborough Metropolitan.

New York City Railway.—See Interborough Metropolitan.

Ocilla & Valdosta.—H. C. McFadden, General Freight and Passenger Agent of the Atlanta, Birmingham & Atlantic, has been elected President of the Ocilla & Valdosta, succeeding J. A. J. Henderson, resigned.

Pittsburg, Binghamton & Eastern.—Thomas H. Watkins has been elected President, succeeding F. A. Sawyer, resigned. The Pittsburg & Eastern is building a line from Clearfield, Pa., to Binghamton, N. Y.

Southern Pacific.—W. B. Cutting has been elected a Director, succeeding D. O. Mills, resigned.

Operating Officers.

Boston & Albany.—W. J. Fripp, Assistant General Superintendent, has been appointed General Superintendent, succeeding J. B. Stewart, resigned.

Central of New Jersey.—Clement F. Merrill has been appointed Assistant Superintendent of the Lehigh & Susquehanna division. Mr. Merrill was born in 1877 and graduated from Amherst College in 1899. A year after that he was in the engineering department of the Illinois, Indiana & Iowa, now part of the Chicago, Indiana & Southern. Then, for 18 months, he was chief clerk to the Trainmaster of the Philadelphia & Reading at Harrisburg, Pa. He then was appointed chief clerk to the Trainmaster of the Central of New Jersey at Mauch Chunk, Pa. Two years later he was made Assistant Trainmaster, with headquarters at Northampton, Pa., where he remained until his recent promotion.

Detroit, Toledo & Ironton.—J. H. Strubel has been appointed Assistant General Manager.

Grand Trunk.—W. H. Farrell has been appointed Acting Superintendent of Terminals at Toronto, succeeding to the duties of

H. H. Brewer, resigned to go to another railroad company. C. L. Mayne, Superintendent of Terminals at Montreal, has resigned to go to another railroad company, and his former office has been abolished. H. F. Coyle, Assistant Superintendent at Island Pond, Vt., has been appointed Assistant Superintendent at Montreal, in charge of terminals and with authority over the Fourth district, and the office of Assistant Superintendent at Island Pond has been abolished. Stanton Ennes, Assistant Superintendent of the Ottawa division, has resigned to go to another railroad company, and his former office has been abolished. J. J. Connelly has been appointed Trainmaster of the First, Second and Third districts, with office at Island Pond.

Traffic Officers.

Atlanta, Birmingham & Atlantic.—H. C. McFadden, General Freight and Passenger Agent, has resigned.

Chicago, Rock Island & Pacific.—William Hughes, commercial agent at Milwaukee, Wis., has been appointed General Agent at that place, succeeding T. O. Jennings, resigned.

Denver & Rio Grande.—B. W. Robbins has been appointed General Agent at Grand Junction, Colo.

Illinois Central.—A. M. Dale, General Agent at St. Louis, has resigned, effective May 1.

St. Joseph & Grand Island.—See Tidewater Railway.

Southern Pacific.—A. W. Reeves, General Agent at Mexico City, has been appointed General Agent at El Paso, Tex. W. C. McCormick succeeds Mr. Reeves.

Southern.—The freight traffic divisions of this company have been rearranged, as follows:

WASHINGTON TRAFFIC DIVISION.—Washington, D. C., to Danville, Va. (inclusive); Alexandria, Va., to Bluemont, Va.; Manassas, Va., to Harrisonburg, Va.; Calverton, Va., to Warrenton, Va.; Franklin Junction, Va., to Rocky Mount, Va.

RICHMOND TRAFFIC DIVISION.—West Point, Va., to Danville, Va.; Keysville, Va., to Durham, N. C. (not inclusive); Oxford, N. C., to Henderson, N. C.

DANVILLE TRAFFIC DIVISION.—Goldsboro, N. C., to North Wilkesboro, N. C.; Danville, Va., to Charlotte, N. C. (not inclusive); Salisbury, N. C., to Norwood, N. C.; High Point, N. C., to Asheboro, N. C.; Winston-Salem, N. C., to Mooresville, N. C.; Mount Airy, N. C., to Sanford, N. C.; Stokesdale, N. C., to Madison, N. C.; Climax, N. C., to Ramseur, N. C.; University, N. C., to Chapel Hill, N. C.

NORFOLK TRAFFIC DIVISION.—Cities of Norfolk, Portsmouth and Pinners Point, Va.; West Norfolk, Va., to Danville, Va. (not inclusive); Claremont Wharf, Va., to Emporia, Va.; Buffalo Junction, Va., to Buffalo Lithia Springs, Va.; Emporia, Va., to Hitchcock Mill, Va.; N. & S. C. Junction, N.C., to Holloway Mines, N.C.; Shoulders Hill,Va.. to Shops,Va.

ASHEVILLE TRAFFIC DIVISION.—Salisbury, N. C., to Paint Rock, N. C. (not including Salisbury); Taylorsville, N. C., to Charlotte, N. C. (not inclusive); Murphy Junction, N. C., to Murphy, N. C.; Biltmore, N. C., to Spartanburg Junction, S. C. (not inclusive); Hendersonville, N. C., to Lake Toxaway, N. C.

COLUMBIA TRAFFIC DIVISION.—Charlotte, N. C. to Augusta, Ga.; Edgefield, S. C., to Aiken, S. C.; Greenville, S. C., to Columbia, S. C.; Hodges, S. C., to Abbeville, S. C.; Spartanburg Junction, S. C., to Alston, S. C.; Charlotte, N. C., to Tugalo River (Madison, S. C.); Lockhart Junction, S. C., to Lockhart, S. C.; Cayce, S. C., to Savannah, Ga. (inclusive); Batesburg, S. C., to Perry, S. C.

CHARLESTON TRAFFIC DIVISION.—Charleston, S. C., to Augusta, Ga.; Columbia, S. C., to Branchville, S. C.; Kingville, S. C., to Camden, S. C.; Sumter Branch; Camden, S. C., to Marion, N. C. (neither inclusive); Gaffney Branch.

ATLANTA TRAFFIC DIVISION.—Atlanta, Ga., to Deercourt, Ga. (Tugalo River); Toccoa, Ga., to Elberton, Ga.; Chamblee, Ga., to Roswell, Ga.; Atlanta, Ga., to Brunswick, Ga.; Cochran, Ga., to Hawkinsville, Ga.; Atlanta, Ga., to Fort Valley, Ga.; Lula, Ga., to Athens, Ga.; Ooltewah Junction, Tenn. (not inclusive), to Atlanta, Ga.; Rome, Ga., to Attalla, Ala. (not including Gadsden, Alabama City, or Attalla, Ala.); City of Jacksonville, Fla.

COLUMBUS TRAFFIC DIVISION.—McDonough, Ga., to Columbus, Ga.

KNOXVILLE TRAFFIC DIVISION.—Bristol, Tenn., to Chattanooga, Tenn. (not including Chattanooga); Morristown, Tenn., to Paint Rock, N. C. (not including Paint Rock); Embreeville Junction, Tenn., to Embreeville, Tenn.; Bulls Gap, Tenn., to Rogersville, Tenn.; Knoxville, Tenn., to Middlesboro, Ky.; Knoxville, Tenn., to Harriman Junction, Tenn.; Clinton, Tenn., to Jellico, Tenn., and branches; Cleveland, Tenn., to Cohutta, Ga. (not including Cohutta); Vasper, Tenn., to La Follette, Tenn.; Clear Fork Branch; Bennetts Fork Branch.

NASHVILLE TRAFFIC DIVISION.—Nashville, Tenn., to Harriman Junction, Tenn.(not inclusive); Carthage Junction, Tenn., to Carthage, Tenn.; Millstone Junction, Tenn., to Millstone, Tenn.; Monterey, Tenn., to Wilder, Tenn.; Campbell Junction to Isoline, Tenn.

MEMPHIS TRAFFIC DIVISION.—Chattanooga, Tenn., to Memphis, Tenn.; Tuscumbia, Ala., to Florence, Ala.; Moscow, Tenn., to Somerville, Tenn.

BIRMINGHAM TRAFFIC DIVISION.—Austell, Ga., to Steens, Miss., and branches (not including Austell); Rome, Ga., (not inclusive), to Oxford, Ala.; Gurnee Junction, Ala., to Blockton, Ala., and Branches; Birmingham, Ala., to Wilton, Ala.; Bessemer Branch (Woodlawn, Ala., to Bessemer, Ala.); Ensley Southern Ry.

MOBILE TRAFFIC DIVISION.—Oxford, Ala. (not inclusive), to Selma, Ala.; Selma, Ala., to Meridian, Miss.; Marion Junction, Ala., to Akron, Ala.; Marion Junction, Ala., to Mobile, Ala.

J. H. Drake is General Freight Agent at Richmond, Va., in charge of the Washington, Richmond, Norfolk and Danville traffic divisions; E. H. Shaw is General Freight Agent at Charleston, S. C., in charge of the Charleston, Columbia and Asheville traffic divisions; Randall Clifton is General Freight Agent at Atlanta, Ga., in charge of the Atlanta and Columbus traffic divisions, and of Florida agencies; H. L. Miller is General Freight Agent at Knoxville, Tenn., in charge of the Knoxville traffic division; R. B. Pegram is General Freight Agent at Nashville, Tenn., in charge of the Nashville traffic division; I. L. Graves is General Freight Agent at Memphis, Tenn., in charge of the Memphis traffic division; R. L. Simpson is General Freight Agent at Birmingham, Ala., in charge of the Birmingham and Mobile traffic divisions.

R. A. Campbell, Assistant General Freight Agent of the St. Louis-Louisville lines, has been appointed General Freight Agent of these lines.

Tidewater.—S. M. Adsit, General Freight and Passenger Agent of the St. Joseph & Grand Island, has been appointed General Freight and Passenger Agent of the Tidewater Railway and the Deepwater Railway, effective May 1.

Engineering and Rolling Stock Officers.

Central of New Jersey.—W. T. Girten has been appointed General Storekeeper, with office at Elizabethport, N. J., succeeding H. S. Hoskinson, resigned to go into other business.

Chicago, Burlington & Quincy.—T. J. Frier has been appointed General Storekeeper, with office at Chicago, Ill., succeeding to the duties of the supply agents on the lines east and west of the Missouri river, which positions have been abolished.

Chicago, Rock Island & Gulf.—P. J. Colligan has been appointed Acting Master Mechanic at Fort Worth, Tex., succeeding to the duties of J. E. Holtz, resigned.

Great Northern.—I. W. Smith has been appointed Master Mechanic at Crookston, Mont., succeeding R. H. Smith, transferred.

Kansas City Southern.—R. L. Stewart, general foreman, has been appointed Master Mechanic at Pittsburg, Kan., succeeding W. B. Dunlevy.

New York Central & Hudson River.—C. P. Diehr has been appointed Master Mechanic at Avis, Pa.

LOCOMOTIVE BUILDING.

The Elgin, Joliet & Eastern will soon be in the market for locomotives and cars.

The Canadian Northern has ordered two eight-wheel 50-ton locomotives from the Hicks Locomotive & Car Works.

The Railway Steel-Spring Co., New York, is said to have ordered one locomotive from the American Locomotive Co.

The Texas Central has ordered four consolidation (2-8-0) type locomotives from the American Locomotive Co., for September delivery.

The J. D. MacArthur Company, Winnipeg, Man., has ordered one eight-wheel 50-ton locomotive from the Hicks Locomotive & Car Works.

The Canadian Pacific, it is said, is building 10 passenger and two switching locomotives at its Angus shops, and has ordered 10 passenger and freight locomotives from the Locomotive & Machine Co., of Montreal.

CAR BUILDING.

The Seaboard Air Line is in the market for 1,500 cars.

The Chicago City Railway is about to order 300 city electric cars.

The Union Railroad is said to be figuring on some freight equipment.

The American Car & Foundry Company has miscellaneous orders for 310 cars.

The American Steel & Wire Co. has ordered 175 cars from the Youngstown Car Manufacturing Co.

The Fairbanks Company, Pittsburg, has ordered 25 flat cars from the Youngstown Car Manufacturing Co.

The Minnesota Game and Fish Commission has ordered one special car from the Hicks Locomotive & Car Works.

The National Tube Co. has ordered some all-steel cars of 40,000 lbs. capacity from the Youngstown Car Manufacturing Co.

The South Manchuria is said to be in the market for 1,000

cars in addition to the 616 ordered from the American Car & Foundry Co.

The Kiushiu Railway, Japan, has ordered some passenger cars from the J. G. Brill Co. and 25 trucks and 25 underframes for cars to be built in Japan.

The Chicago, Rock Island & Pacific has ordered from the American Car & Foundry Company 103 box cars and 179 furniture cars.

The Intercolonial, it is understood, has ordered 130 hopper cars of 30,000 lbs. capacity, 100 box cars of 60,000 lbs. capacity, 70 dumping cars of 30,000 lbs. capacity and five refrigerator cars of 60,000 lbs. capacity from Rhodes, Curry & Co.

The Texas Central has ordered 100 box cars of 60,000 lbs. capacity from the American Car & Foundry Co., for August delivery. These cars will measure 36 ft. 7⅝ in. long, 9 ft. ⅝ in. wide and 8 ft. high, outside measurements. The special equipment includes:

Brasses	More-Jones Brass & Metal Co.
Couplers	R. E. Janney

The Northwestern Elevated Railroad Company, Chicago, Ill., as reported in the *Railroad Gazette* of August 3, has ordered 34 motor cars from the Jewett Car Company. These cars will weigh 28,900 lbs., and will measure 34 ft. long, 7 ft. 8¼ in. wide and 8 ft. 6 in. high, inside measurements. The special equipment includes:

Couplers	Stearns & Ward
Curtain material	Pantasote
Draft rigging	Stearns & Ward
Paint	Northwestern Elevated standard
Springs	Pittsburg Spring & Steel Co.
Trucks	Hedley
Wheels	Standard Steel Works

The Intercolonial, as reported in the *Railroad Gazette* of March 22, has ordered one sleeping car from the Pullman Company. This car will measure 72 ft. long, 9 ft. 8 in. wide and 14 ft. 6¼ in. high, over all. The body and underframe will be of wood. The special equipment includes:

Bolsters	American Steel Foundry Co.
Brakes	Westinghouse
Brake-beams	National Hollow
Brake-shoes	Christy
Couplers	Janney
Curtain material	Pantasote
Heating System	Pullman double coil heater, in connection with Safety Car Heating & Ltg. Co.
Journal boxes	Pullman standard
Light	Pintsch gas
Paint	Pullman standard
Platforms	Pullman standard steel, type "A"
Roofs	Pullman standard
Seats	Pullman standard, high back
Springs	Crucible steel
Trucks	Pullman standard
Vestibules	Pullman standard

The Canadian Northern, as previously reported in the *Railroad Gazette*, has ordered one cafe car from Barney & Smith, for June delivery, and 20 refrigerator cars of 30 tons capacity from Rhodes, Curry & Co., for delivery by June 30, 1907. The cafe car will measure 72 ft. long and 9 ft. 10½ in. wide, over all. The body and underframe will be of wood. The refrigerator cars will measure 29 ft. 6 in. long, 8 ft. 3¾ in. wide and 7 ft. 8¼ in. high, inside measurements, and 39 ft. 9¾ in. long, 9 ft. ¾ in. wide and 14 ft. high, over all. The bodies will be of wood. The special equipment for all cars includes:

	Cafe.	Refrigerator.
Axles		Rhodes, Curry & Co.
Bolsters		Simplex.
Brakes	Westinghouse.	Westinghouse.
Brake-beams	Westinghouse; B. & S. make.	Simplex.
Brake-shoes	Christie.	
Brasses		Canadian Bronze Co.
Couplers	Chicago.	Latrobe.
Curtain fixtures	Forsyth.	
Curtain material	Pantasote, silk lined.	
Doors	Mahogany.	
Draft rigging	Miner.	Miner tandem.
Dust guards	Wooden.	
Heating system	Gold duplex.	
Journal boxes		McCord.
Light	Com'rc'l acetylene.	
Paint		Sherwin-Williams.
Roofs		Am. Asp. & Rub. Co.
Trucks	B. & S. standard.	
Vestibules	Pullman.	
Wheels	Barney & Smith.	Rhodes, Curry & Co.

RAILROAD STRUCTURES.

Binghamton, N. Y.—Announcement has been made by President Underwood, of the Erie, that car shops will be established at this place, and the shops at Susquehanna, Pa., will be abandoned.

Buffalo, N. Y.—According to local reports, the New York Central lines are considering plans for a large storage yard, and shops, to be built at Gardenville, near Buffalo.

Excelsior Springs, Mo.—Work is to be started at once by the Wabash on a new station here to cost about $30,000.

Fort William, Ont.—The Grand Trunk Pacific, it is said, has decided to put up two large grain elevators each to have a capacity of 2,500,000 bushels, and to cost $1,000,000; one to be built at this place and the other at Tiffin.

The Canadian Pacific may build a bridge over the Kaministiquia river to cost several thousand dollars.

Hamilton, Ont.—The Dominion Power & Transmission Co. announces it will put up car shops here.

Joplin, Mo.—The Missouri & North Arkansas, according to local reports, has spent about $150,000 for a site for new terminals and shops, and will shortly begin improvements at an additional expense of $300,000 to include shop buildings and a new station.

Muskoka, Ont.—The Canadian Pacific has decided to make this place a division point, and will put up a roundhouse, shops and an office building.

St. Clair, Pa.—It is reported that the Philadelphia & Reading will put up new shops and a large yard here to cost about $1,000,000.

Smith's Falls, Ont.—The Canadian Pacific is to put up a roundhouse here to have 22 stalls, and will also build a machine shop 40 ft. x 90 ft.

Strathcone, Alb.—The Canadian Pacific has changed its plans for its station to be built here, and will put up a larger building than originally intended, to cost $60,000. A 22-stall roundhouse is also to be put up.

Tacoma, Wash.—Local reports state that the Chicago, Milwaukee & St. Paul has commenced work on its terminals here. A tract of about 200 acres has been bought, and the work will be carried out during the next two years.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alaska Central.—This company, building a line from Seward north via Susitua valley to the Tanana river, 450 miles, has let a contract to Snow & Watson for building 25 miles, and grading work has just been started on this section. An officer writes that other contracts will probably be let in June for building 30 miles additional. The company has also finished surveys for a branch from Knik, about 150 miles north of its southern terminus, east to Matanuska, 40 miles.

Atlanta, Birmingham & Atlantic.—This company started surveys last year to extend its road from Atlanta, Ga., southwest to New Orleans, about 500 miles. The new line is to cross the Birmingham extension about 100 miles southwest from Atlanta. A report from Selma, Ala., says that the company is to build from Talladega, Ala., on the Birmingham extension, southwest to Selma, and thence to Baton Rouge, La., from which point it will enter New Orleans over either its own line or the line of some other company. This route is to form part of the main line. There is also to be a line built from Selma north to Birmingham, also connecting with the Birmingham extension, giving two routes over the A., B. & A. between Talladega and Selma. On the Birmingham extension track was laid last year as far as La Grange, just east of the Chattahoochee river. The American Bridge Company is putting up a bridge over the river. The roadbed is finished for about 50 miles west of the river, and track laying will be started on this section as soon as the bridge work is finished. On the branch between Chalybeate, Ga., and Atlanta track laying is to be started within the next 30 days.

Barker & Clark's Gap.—See Norfolk & Western.

Brandon & Laurel.—Incorporated in Mississippi to build from Brandon southeast to Laurel, about 65 miles. The incorporators include: A. M. Shields, L. D. May, H. A. Busick and S. L. McLauren.

Brooklyn Rapid Transit.—Work is now under way connecting the Broadway elevated line of this company with the Williamsburg bridge in the Borough of Brooklyn. Under the terms of the contract work must be finished by October 1, and the company expects to begin running its cars over the bridge during that month. The cost of the improvements will be about $100,000.

Canadian Pacific.—The company will shortly call for bids for a line from New Westminster to Eburne, which, when built, is to be electrified by the British Columbia Electric Street Co.

The company is to build a branch this spring from either Bienfait, Sask., or Estevan to Arcola.

Chicago City Railway.—According to local reports, this company is planning to begin work next month in pursuance of the ordinance passed at the last election, on the improvement of the system at a cost of several millions. The first work will be the laying of new rails, some of which have already been ordered. It is thought that the action of the Chicago City Railway will be followed by the Union Traction.

Clear Fork & Oceana.—See Norfolk & Western.

Cumberland River & Nashville.—An officer writes that this company proposes to build from Corbin, Ky., southwest to Nashville,

Tenn., 160 miles. The proposed route is from Corbin down the Laurel river via Cumberland to Burnside, Ky., thence to Monticello, Albany and Nashville. There is to be a bridge over the South Fork river. Contracts let to C. E. Coon and to Peter & Co., of Louisville, Ky., for the section from the Cincinnati, New Orleans & Texas Pacific near Burnside, Ky., to Monticello, about 20 miles. (March 15, p. 382.)

GRAND TRUNK PACIFIC.—Sub-contracts are being let by N. P. and J. P. Davis for building 70 miles on the line of this road from the Quebec bridge east.

GREAT NORTHERN.—According to reports from Moose Jaw, Sask., this company is planning to secure an entrance into Saskatchewan, under the name of the Saskatchewan Central, projected from the boundary of Manitoba west. The proposed route is through the Cannington district via Willow Bunch to Alberta, with branches into the Goose Lake district.

GREAT WEST.—This company has been incorporated with headquarters at Cowley, Alb., to build a line from that town to the Gap on the Crow's Nest Pass railroad.

GULF, BEAUMONT & GREAT NORTHERN.—See Gulf, Colorado & Santa Fe.

GULF, BEAUMONT & KANSAS CITY.—See Gulf, Colorado & Santa Fe.

GULF, COLORADO & SANTA FE.—The Texas Legislature has passed over the Governor's veto a bill authorizing the merger of the Gulf, Colorado & Santa Fe, the Gulf, Beaumont & Kansas City, the Texas Central and the Gulf, Beaumont & Great Northern. The bill requires that an extension of the consolidated lines be built within two years from Longview, Tex., northerly 125 miles to a point on the Red river.

KENTUCKY HIGHLANDS.—Incorporated in Kentucky with $250,000 capital to build from Frankfort, Ky., south to Versailles, thence east to Lexington, about 30 miles. The incorporators include: J. C. Doolan, E. M. Trabu, A. Cox, S. H. Owen, S. S. Bush, J. D. Winster and M. Wordman, all of Louisville. The Illinois Central is reported to be back of this project.

LEWISTON, AUGUSTA & WATERVILLE (ELECTRIC).—According to reports from Lewiston, Me., a company under this name has given contracts to Gore Bros., of Boston, for building nine miles of electric line from Sabattus, Me., to Mechanic Falls; also from Sabattus to Gardner, 21 miles, the latter conditional upon the company obtaining the necessary right of way. On the completion of this work, Lewiston will have connections with Portland and, by way of Brunswick, with Augusta and Waterville, over electric lines.

LOUISIANA RAILWAY & NAVIGATION COMPANY.—This company on April 14 opened for through service its line from Shreveport, La., to New Orleans.

MACON, AMERICUS & ALBANY (ELECTRIC).—Incorporated in Georgia with $200,000 capital to build an electric line from Macon, Ga., southwest via Byron, Fort Valley, Marshallville, Montezuma, Oglethorpe, Andersonville, Americus and Lessburg to Albany, about 150 miles. The incorporators include: W. J. Massee, J. T. Moore, J. N. Neel, M. F. Hatcher and D. W. Davis, of Macon; N. J. Cruger, of Albany; A. C. Riley, of Fort Valley, and J. C. Walker, of Marshallville.

MEMPHIS TERMINAL.—This company at a recent meeting elected the following officers: J. H. Watkins, President; J. L. Lancaster, Vice-President; O. F. Ghrist, Secretary, and F. H. Hamilton, Treasurer. A. W. Briggs is the Attorney. The company proposes to buy its right of way from the Mississippi river bridge to Polk street, in the southern part of Memphis, along the line of Iowa avenue. About two-thirds of this has been bought, and work is soon to be started on the terminal yards and sidings and on the union station. (March 27, p. 427.)

NATCHITOCHES EAST & WEST.—This company, it is reported, has secured funds to make surveys and buy the right of way for its proposed line from Natchitoches, La., southeast to Colfax, 30 miles. C. H. Teal, Natchitoches, is President.

NEW IBERIA, ST. MARTINSVILLE & NORTHERN.—Organized in Louisiana with $500,000, to build from New Iberia north to Port Parre, via St. Martinsville, Breaux Bridge and Arnaudville, 40 miles. F. M. Welch, President; J. R. Oliver, First Vice-President, St. Martinsville; J. Dreyfus, Treasurer; A. B. Romero, Secretary, New Iberia.

NEW YORK & PENNSYLVANIA TRACTION.—Surveys are being made by this company for a high-speed electric line from Somerville, N. J., south to Princeton, 18 miles. Most of the right of way will be 50 to 100 ft. wide over a private right of way. There is to be a bridge 1,800 ft. long over the Raritan river. T. D. Kitchen is the engineer in charge of the surveys.

NEW YORK SUBWAYS.—Bids were recently opened by the Board of Rapid Transit Railroad Commissioners for building the first section of the proposed subway to connect the Williamsburg and Brooklyn bridges. This first section covers the longest and most important section extending from Pearl to Canal streets, in the Borough of Manhattan. The bids were: Degnon Contracting Co. for the tunnel $2,952,000 and $83,000 additional for the pipe galleries, and the Cranford Company, who offered to construct the tunnel for $3,775,000 and the pipe galleries for $50,000 additional.

NORFOLK & WESTERN.—The Clear Fork & Oceana has been organized to build a line from the mouth of Clear Fork on the Guyandotte river in Wyoming County, W. Va., to a point near Knob Fork.

Under the name of the Barker & Clark's Gap, a line is to be built from a point near Clark's Gap in Wyoming County, W. Va., to a point on the Guyandotte river, near the mouth of Barker's creek.

NORTHWESTERN PACIFIC.—Surveys are reported made by this company for extending the Fort Bragg & Southwestern, already built from Albion, Cal., on the Pacific coast, east to Wendling, southeast from that place to a junction with the main line of the N. P., at Cloverdale.

Plans are being made to extend the line already finished to Alpine from Fort Bragg on the Pacific coast east to Willits on the N. P. This road is owned by the Johnson Lumber interests and was built for logging purposes.

OKLAHOMA CITY, EL RENO & SOUTHWESTERN (ELECTRIC).—Incorporated in Oklahoma to build 275 miles of electric lines from El Reno, Okla., to connect Oklahoma City, Chickasha, Anadarko, Hobart and Lawton on the south, and Kingfisher, Hennessy, Enid, Medford, Kiel and Okeene on the north. J. W. Smith, F. Ehler, C. C. Smith and E. B. Cockerell, of Hennessy, and W. R. Blackburn, of Kingfisher, are incorporators.

OKLAHOMA CITY RAPID TRANSIT.—Incorporated in Oklahoma with $2,000,000 capital, to build an electric line from Oklahoma City east to Tecumseh, through Oklahoma, Cleveland and Pottawatomie counties, 40 miles. The incorporators include: G. Silsby, of Saginaw, Mich.; G. M. Cissna, J. H. Surber, D. D. Klapp, E. W. Milburn, G. Weed, M. H. Tennison, S. B. Mitchell and W. E. Howell, of Tecumseh.

OPELOUSAS, GULF & NORTHEASTERN.—See Texas & Pacific.

PACHUCA, ZOMAPAN & TAMPICO.—Richard Honey, of Mexico City, is reported to be building a line to give Mexico City direct connection with the port of Tampico. Mr. Honey built and operated the railroad from Mexico City to Apulco, 102 miles, and sold it to the Mexican Central a year or two ago. The route of the new line is from Pachuca to Tampico, about 250 miles. Survey for the entire line has been made and work on the first 32 miles is under way. The maximum grade of the first 62 miles will be 1½ per cent. In descending from the plateau to the low coast country the grade will be considerably higher than for the first section, and much heavy work will be encountered. Concessions have been granted by the federal government and by the state of Hidalgo. Free right of way for the road through that state is also given.

PANHANDLE SHORT LINE.—This company has filed a charter in Texas to build from Hereford, Tex., south to Stanton, about 210 miles. J. H. Ransom, J. E. Howard and J. L. Fuqua, of Deaf Smith County, Texas; J. C. Archabald, A. R. Donaldson, W. E. Kitter and O. G. Place, of Boulder County, Colo., are interested.

PEARL RIVER VALLEY.—This company, it is said, has located its proposed line from Jackson, Miss., northeast to Carthage, 50 miles, and is to begin work this summer. The line is projected to Birmingham, Ala., 270 miles. F. W. Herrick, Milwaukee, Wis., is President. (March 15, p. 389.)

PHILADELPHIA & READING.—Plans are reported being made by this company to build a double-track freight belt line north of Coatesville, Pa., at a cost of about $100,000. The line is to be finished next fall, and is to connect with the large industrial works in Coatesville.

PORTLAND & RUMFORD FALLS RAILROAD.—This company, recently incorporated to build a line from Portland, Me., south to the coast at Falmouth and Portland, about 30 miles, it is said has leased the property of the Portland & Rumford Falls Railway and the Rumford Falls & Rangeley Lakes Railroad. The new organization has secured large tracts of land on both sides of Portland harbor, and has bought additional land at South Portland as a site for steamship docks, elevators and other facilities for handling heavy freight. At the hearing before the Legislative Committee on the application of the company for its charter, it was stated that the Portland line was to provide an entrance for the Canadian Pacific to that place. Connection is to be made from the northern end with the Canadian Pacific at Megantic, at which point it would also connect with the Quebec Central. (March 29, p. 468.)

PORTLAND & RUMFORD FALLS RAILWAY.—See Portland & Rumford Falls Railroad.

RUMFORD FALLS & RANGELEY LAKES RAILROAD.—See Portland & Rumford Falls Railroad.

SASKATCHEWAN CENTRAL.—See Great Northern.

SAVANNAH & SOUTHWESTERN.—Under this name, a company has applied for incorporation with a capital of $7,000,000, to build a line from Savannah southwest through Baxley, Douglas, Moultrie and Cairo, Ga., Quincey and Apalachicola, Fla., to a point on the gulf coast, approximately 300 miles. L. McNeill, D. G. Purse and J. H. H. Antelman, of Savannah, Ga.; C. W. Dean, of Baxley; W. A. Walker, of Cairo; J. A. Carlton, of Moultrie, and G. W. Quincey, of Douglas, are interested.

SOUTHERN.—According to reports from Alabama, this company has suspended work on its improvements in northern Alabama and southern Tennessee, including the extension of the Stevenson & Chattanooga branch, and the tunnel through Lookout mountain. It is also said that the company has canceled the contract for the steel superstructure of the bridge over the Tennessee river at Otis Island.

SOUTHWEST RAILWAY.—Incorporated in Texas to build a line from Henrietta southwest through Clay and Archer counties, 35 miles. The incorporators include: E. S. Hughes and H. James, of Abilene; J. W. Broad and N. J. Denison, of Fort Worth, Tex.

TEXAS & GULF.—See Gulf, Colorado & Santa Fe.

TEXAS & PACIFIC.—It is announced that the Opelousas, Gulf & Northeastern, building from Opelousas, La., northeast to a point on the Mississippi river and southwest to the gulf, will have the section from Opelousas to Crowley, 81 miles, finished about the middle of May. (March 15, p. 393.)

VIRDEN & TAYLORVILLE TRACTION.—Incorporated in Illinois to build an electric line from Virden, Macoupin County, Ill., east to Taylorville, about 26 miles. The incorporators are: H. C. Simon, W. E. Allenson, J. Coldern and T. P. Tenney, of Virden, and E. E. Barclay, of Springfield.

WESTERN PACIFIC.—According to reports from Utah, contracts for the remaining 326 miles in Nevada have been let to the Utah Construction Co., of Ogden. This company previously had contracts for 110 miles in Utah, 107 miles in Nevada and 174 miles in California. (March 15, p. 394.)

WEST VIRGINIA CONNECTING.—This company, it is reported, has surveys made for a line from Bellington, W. Va., to Waynesburg, Pa., and will continue surveys from Waynesburg to Carnegie, near Pittsburg. Contracts for building the line will be let in May. J. V. Thompson and J. V. Maroney are interested.

WINNIPEG & NORTHWESTERN.—Incorporated to build a line from Winnipeg to the Lobstick river via Lakes Winnipeg, Manitoba and Winnipegosis with branches from Prince Albert to Battleford, from Saddle Lake to Lac du Biche, from Victoria, Alb., to Athabasca Landing and from Shoal Lake to Swan Lake. The incorporators are: Henry Fox, London, England; A. T. Drummond; P. Howland, W. K. George, H. M. Mowat, Toronto.

YELLOWSTONE PARK.—Holders of some of the $432,000 outstanding first mortgage 5 per cent. bonds of 1945 have brought suit for the foreclosure of the mortgage, the July, 1906, interest being unpaid. The road is under construction from Bridger, Mont., on the Northern Pacific, to Cook City, 125 miles, including branches, of which 31 miles from Bridger is in operation.

RAILROAD CORPORATION NEWS.

BALTIMORE & OHIO.—See Chicago Terminal Transfer.

BOSTON ELEVATED.—This company has asked permission to issue $8,000,000 additional stock and $5,800,000 additional bonds. There is already outstanding $13,300,000 stock and $7,500,000 4 per cent. debenture bonds of 1935. The new stock is for two subways in Cambridge, and the new bonds are for equipment and the funding of floating debt.

CHICAGO TERMINAL TRANSFER.—Some time ago, the date was announced for the foreclosure sale of this property. On March 30 the Baltimore & Ohio asked permission to assume, before May 3, the date of the sale, the $15,140,000 outstanding Chicago Terminal Transfer first mortgage, 4 per cent. bonds of 1947, including the accrued interest for two years, stipulating that the subsequent sale of the property be made subject to the Baltimore & Ohio lease of the yards and station. On April 16 the United States circuit court gave the B. & O. the right to assume the bonds, subject, however, to the right of the Chicago Terminal Transfer stockholders to attack the lease under which the Baltimore & Ohio uses the terminal. This lease was made in 1903, after the last reorganization of the Chicago Terminal Transfer, while the leases to the Chicago Great Western and the Chicago Junction were made before that reorganization.

CLEVELAND, SOUTHWESTERN & COLUMBUS TRACTION.—This company, which was recently incorporated as a consolidation of three Ohio traction lines operating 170 miles of road, plans to have listed on the New York Stock Exchange $10,000,000 20-year 5 per cent. general mortgage bonds, $2,500,000 5 per cent. cumulative preferred stock and $7,500,000 common stock. (March 15, p. 378.)

DELAWARE & EASTERN.—A special meeting of the stockholders has been called for May 13 to vote on a proposition to lease the property to the Schenectady & Margaretsville. The Delaware & Eastern runs from East Branch, N. Y., to Arkville, 37 miles, and the Schenectady & Margaretsville is a proposed extension of the D. & E. from Arkville north to Schenectady.

GRAND TRUNK.—An annual dividend of 3 per cent. for the year 1906 has been declared, payable April 26, on the $34,765,000 outstanding third preference 4 per cent. stock, on which 1 per cent. was paid in 1902, 2 per cent. in 1903, nothing in 1904 and 2 per cent. in 1905.

GULF, BEAUMONT & GREAT NORTHERN.—See Gulf, Colorado and Santa Fe.

GULF, BEAUMONT & KANSAS CITY.—See Gulf, Colorado & Santa Fe.

GULF, COLORADO & SANTA FE.—The Texas legislature has passed over the Governor's veto a bill authorizing the consolidation of the Gulf, Colorado & Santa Fe, the Texas & Gulf, the Gulf, Beaumont & Kansas City and the Gulf, Beaumont & Great Northern. See Construction column.

KALAMAZOO, LAKE SHORE & CHICAGO.—This company has bought the South Haven & Eastern branch of the Pere Marquette, including all the rolling stock, right of way and terminals. The branch runs from Latton to South Haven, 40 miles.

MISSOURI PACIFIC.—This company has sold to Tailer & Co., New York, $4,043,000 equipment trust 5 per cent. bonds, payable in ten equal annual instalments, beginning May 1, 1908. They are secured on 50 consolidation locomotives, 3,000 coal cars, 750 Rodger ballast cars and 750 stock cars. The Knickerbocker Trust Company is Trustee for $3,350,000 of this issue, and the Mercantile Trust Company is Trustee for the remainder.

NEW ORLEANS TERMINAL.—This company has sold to New York bankers $2,500,000 two-year 6 per cent. notes guaranteed by the Southern and the St. Louis & San Francisco, which leases the property from the New Orleans Terminal. The notes are secured on $4,000,000 first mortgage 4 per cent. bonds of the New Orleans Terminal.

OCILLA & VALDOSTA.—This road, which runs from Ocilla, Ga., to Broxton, 25 miles, and which has $800,000 capital stock and is building an extension to Fitzgerald, has been sold to H. C. McFadden and associates.

OREGON SHORT LINE.—See Pennsylvania Company.

PENNSYLVANIA.—See Pennsylvania Company.

PENNSYLVANIA COMPANY.—The annual report for the year ended December 31, 1906, shows that the company at the end of the year held $36,393,432 Oregon Short Line 4½ per cent. notes. As it does not appear from the report that these notes were issued in payment of Baltimore & Ohio stock, it is probable that they are a part of certain securities turned over to the Pennsylvania Company by the Pennsylvania Railroad in return for the $50,000,000 4½ per cent. Pennsylvania Company 18-months notes issued in May, 1906, and about $48,000,000 Pennsylvania Company 15-year, 3¾ per cent. loan placed in Paris in June, 1906.

PERE MARQUETTE.—See Kalamazoo, Lake Shore & Chicago.

PHILADELPHIA & READING.—It is said this company has acquired the Williams Valley Railroad, which runs from Brookside, Pa., on the Reading, to Lykens, 12 miles, and has outstanding $90,000 stock and $120,000 5 per cent. first mortgage bonds of 1923.

ST. LOUIS & SAN FRANCISCO.—See New Orleans Terminal.

SCHENECTADY & MARGARETSVILLE.—See Delaware & Eastern.

SOUTH DAKOTA CENTRAL.—G. H. Rollins & Sons, Chicago, are offering at par and interest $200,000 first mortgage 5 per cent. bonds of 1927, being part of an authorized issue of $730,000. The road is in operation from Sioux City, S. Dak., to Rutland, 42 miles, and contracts are being let to extend it to Watertown, 58 miles.

SOUTHERN.—See New Orleans Terminal.

TEXAS & GULF.—See Gulf, Colorado & Santa Fe.

WILLIAMS VALLEY.—See Philadelphia & Reading.